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ELEMENTS. &c.



ELEMENTS
OF THE
ETIOLOGY AND PHILOSOPHY
OF
EPIDEMICS.

IN TWO PARTS.

BY JOSEPH MATHER SMITH, M.D.

FELLOW OF THE COLLEGE OF PHYSICIANS AND SURGEONS OF THE UNIVERSITY OF THE STATE OF NEW-YORK ; OF THE PHYSICO-MEDICAL SOCIETY OF NEW-YORK, &c.

"If one were to examine all the branches of Physic, nothing, perhaps, would appear so surprising as the different and perfectly dissimilar face of epidemic diseases."

Sydenham.

New-York :

PRINTED BY AND FOR J. & J. HARPER.

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Southern District of New-York, ss.

BE IT REMEMBERED, That on the 22d day of May, in the forty-sixth year of the Independence of the United States of America, J. & J. HARPER, of the said District, have deposited in this office the title of a Book, the right whereof they claim as proprietors, in the words following, to wit;

"Elements of the Etiology and Philosophy of Epidemics. In two Parts. By Joseph Mather Smith, M.D. Fellow of the College of Physicians and Surgeons of the University of the State of New-York; of the Physico-Medical Society of New-York, &c. If we were to examine all the branches of Physic, none perhaps would appear so surprising as the different and perfectly dissimilar face of epidemic diseases. Sydenham."

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JAMES DILL,
Clerk of the Southern District of New-York.

TO

DOCTOR MATSON SMITH,

PRESIDENT OF THE MEDICAL SOCIETY OF THE COUNTY OF
WEST-CHESTER, N. Y.

THE

FOLLOWING PRODUCTION,

IS

RESPECTFULLY DEDICATED,

WITH

THE DEEPEST FEELINGS OF AFFECTION AND GRATITUDE,

BY HIS SON,

THE AUTHOR.

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TO

ANSEL W. IVES, M.D.

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THE NEW-YORK HISTORICAL SOCIETY, &c.

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FOLLOWING PAGES

ARE

RESPECTFULLY INSCRIBED,

IN TESTIMONY OF THE HIGH RESPECT ENTERTAINED FOR

HIS TALENTS AND VIRTUES,

BY HIS FRIEND,

J. M. SMITH.

PREFACE.



THOUGH much has been written on the nature and causes of popular diseases, it may still be said, in the language of the learned Dr. Parr, that “we greatly want a judicious and well connected account of epidemics.”* The inconsiderable progress hitherto made in generalizing the causes, and ascertaining the laws of devastating and wide-spreading diseases, has evidently been owing to the want of a systematic and analytical method of research. The other natural sciences have rapidly advanced, since conjecture and speculation have given place to accurate observation and inductive reasoning; and there is every reason to believe, that the adoption of this mode of inquiry in the study of epidemics will lead to important conclusions.

In the following sheets, the author has attempted to arrange the causes of febrile and epidemic

* Medical Dictionary.

diseases, in systematic order; and to deduce, from an examination of the nature and *modus operandi* of those causes, the laws which govern the rise, prevalence and decline of epidemics; and also, the manner in which these diseases severally modify and supersede each other. By ascertaining the distinguishing characters of things, our knowledge is materially advanced. This, as respects the causes of disease, is no less true than it is of the subjects which belong to other departments of natural science. But in order to obtain enlarged and scientific views of those causes, it is necessary to arrange them in such a manner, that the relations they bear to each other will distinctly appear. This the writer has attempted in the volume now offered to the profession. He is far from presuming, however, that his labours will supply the desideratum adverted to by Dr. Parr; for he believes the period has not yet arrived in which the various phenomena and laws of epidemics can be arranged with definite accuracy. His principal object is to present, in part, the *OUTLINE* of a system of *Etiology*, which, he thinks, will exhibit the leading facts relative to the prevalence of epidemic diseases, in a method as conformable to nature as the present state of the science will admit.

In his arrangement of the remote causes of disease, the author has ventured to introduce such new terms as he deemed essentially necessary to the completion of his design; and he would remark, that in order to understand their import, and to perceive the advantages to be derived from their employment, it is important that his pages be read in course. The nomenclature of febrile diseases has long been enlarged to an extent that enables us to designate, by suitable terms, almost all their varieties; while that of their remote causes has been allowed to remain, for the most part, general, indeterminate and vague. As the successful prosecution of etiological inquiries depends, in a considerable measure, upon the precision with which one cause of disease can be discriminated from another, it is hoped, that, however objectionable the terms he has introduced may appear to the fastidious philologist, they will be found more definite than the phraseology commonly employed in treating of the same subjects.

To these prefatory remarks, the author will only add, that in forming his classification of the remote causes of disease, he has freely availed himself of the labours of those who have preceded him; and that in treating of the philosophy of epidemics, he

has been particularly careful to select his illustrations from the best practical writers. In submitting his work to the inspection of his medical brethren, he is conscious of no other motive than the desire to promote the interests of a science which it is his duty and pleasure to cultivate ; and with this impression, he cheerfully invites the attention of the candid and liberal critic.

New-York, May, 1824.

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ELEMENTS

OF THE

ETIOLOGY AND PHILOSOPHY

OF

EPIDEMICS.



ELEMENTS, &c.

INTRODUCTION.

THE nature and character of diseases are, for the most part, determined by the remote causes which produce them. Hence the importance of investigating those causes, and the propriety of arranging them according to their natural affinities. We generalize those things which minister to the preservation and restoration of health, as the Nutrimenta and Materia Medica; and why may not morbidic agents be also reduced to systematic order?

An arrangement of the external causes of disease, according to the natural method of classification, would prove a valuable contribution to medical science, and might form the basis of a system of natural nosology. How far such an arrangement is practicable in our present state of knowledge, we shall not inquire. Our attention, in the following pages, will be directed to those remote causes

which have an efficient agency in the production of fevers, and especially of epidemics. These constitute by far the largest proportion of human diseases; and their assembled causes may be considered as forming one extensive etiological Class, the natural history of which is extremely interesting to the medical philosopher.

The phenomena and laws of epidemics have never been systematically investigated; and hence it is, that they are yet but imperfectly understood. As our object is to elucidate the philosophy of those diseases, we shall commence with a particular examination and scientific arrangement of their efficient causes. This method of research promises, we think, more satisfactory results than have hitherto been obtained. In pursuing this plan, we shall omit, as unimportant, some of the incidental causes of fever; and, on the other hand, shall occasionally notice a few of those morbid agents which are not strictly febrific.

The difficulties, attending etiological inquiries, are confessedly numerous and peculiar. Of many of the remote causes of disease, we have no other knowledge than what is derived from the observation of their effects. This remark is particularly applicable to those epidemic influences which occasionally operate with desolating fury on communities and nations. To the inherent obscurities of the subject, therefore, may in part be ascribed the tardy advancement of etiology, as well as the various and contradictory opinions which have

prevailed with respect to the causes of particular diseases. In many instances, the most ingenious inquirers have been led to false conclusions, by reasoning from facts presented to them under delusive circumstances. These observations are abundantly verified in the history of medical opinions.

In investigating the nature and causes of febrile diseases, the subject of contagion is considered of primary importance; for, until it is ascertained what disorders are propagated by morbid poisons, the etiology of epidemics must remain, as it has been for ages, hypothetical; and consequently discordant opinions will continue to prevail. Formerly, those exanthematous diseases, which are now universally acknowledged to be specific, and personally communicable, were not regarded as contagious. They were supposed to originate from causes which had no connexion with the diseased body. Sydenham believed them to arise from atmospheric constitutions; and this appears to have been the opinion of many of the ancients.

The progress of etiological science was for a long time impeded by the difficulty of discriminating diseases, essentially different in their nature. "Almost a thousand years," says Dr. Bateman, "elapsed, during which the small-pox, measles, and scarlet fever continued to commit their ravages, and physicians continued to record them, while the individuals who were spared by one of these maladies, were seen to suffer successively from

attacks of the others ; nevertheless, they were still viewed through the eyes of the Arabians, and were universally deemed varieties of one and the same disease, until near the beginning of the eighteenth century ; and it was not till towards the close of that age of enlightened observation, that the distinct character and independent origin of these three contagious disorders were universally perceived and acknowledged.”*

If so much error formerly existed among those who are said to have been nice observers of nature, with how much caution should we adopt their opinions respecting the etiology of febrile diseases ? If they were unable to discover the distinct nature of small-pox, measles, and scarlet fever, we may assuredly distrust their testimony concerning the communicability of plague and other malignant fevers.

Among modern partisans, it has been the custom to cite Hippocrates, Celsus, Aretæus, and Trallian, to prove the noncontagiousness of fevers ; and Thucydides, Lucretius, and Galen, to establish the opposite doctrine. These, it is acknowledged, are venerable authorities ; but it is questionable, whether their observations and modes of philosophizing were sufficiently extensive and analytical, to enable them to decide a question which involves so many considerations as that relating to the contagiousness of fever. Their writings appear to

* Synopsis of Cutaneous Diseases.

furnish no facts calculated to elucidate the subject; yet if their opinions be admitted in the argument, those which favour the views of the anti-contagionists must undoubtedly be regarded as the most worthy of confidence.

But whatever may have been the opinions of the ancients, it is generally agreed, that the theory of febrile contagion was of very limited application, anterior to the middle of the sixteenth century. After that period, it was extended to almost every form of fever; and at length became so general, that not only plague, yellow fever, and typhus, but influenza, consumption, and remittent and intermittent fevers were believed to be personally communicable.

If the older physicians were able to detect a contagious attribute in fever, is it not remarkable, that they were incapable of discovering the distinct and communicable nature of small-pox, chicken-pox, measles, and scarlet fever? and is it not equally remarkable, that the same inductive mode of reasoning, which finally determined the causes and pathology of these diseases, should have led to doubts, and even to a positive denial, of the communicability of fevers? These facts strongly confirm the opinion that the doctrine of febrile contagion was originally founded on loose and unphilosophical data. Is it probable, that at the time when the sciences were receiving large accessions of truth, and when the mode of reasoning, by which those accessions were made, was applied

to this subject, that then, physicians of unquestionable talents and integrity, would have assailed a doctrine which had received universal approbation, had they not discovered by a careful examination of facts that it was founded in error? The accurate and extensive observations of the present day are in perfect accordance with their conclusions; and, if future inquiries be conducted in the manner which of late years has been so successfully pursued, we cannot doubt, that before the lapse of the present century, the dogma which asserts the specific contagiousness of yellow fever, plague, dysentery, typhus, and other fevers, will be forgotten, or only remembered as an error of the schools.

The United States and the West Indies, which embrace many varieties of climate, have afforded a wide field for the cultivation of etiological science. In the former particularly, the essential causes of epidemics have been presented to the observation of physicians, unconnected with those adventitious sources of disease, which, in the crowded districts of Europe, appear in many instances to have been so blended with them as to conceal or obscure their efficient agency.

The fevers of this country have been diligently observed and accurately distinguished; and the question relating to their contagiousness has been extensively and critically investigated. Though there has been much controversy on this subject, the discussion may now be considered as having resulted in the general conviction, that yellow fever,

however desolating its ravages, is never communicated by a specific contagion, but is uniformly produced by a miasmatic poison, generated by materials entirely distinct from the living human body. Reasoning from these facts, and the well-known similarity of phenomena attending the prevalence of yellow fever and plague, we are led to conclude that the latter disease is also destitute of the quality of contagion, and that it is dependent upon a cause analogous to that of the former. The bilious fevers of this country are never suspected of being communicated by contagion. (Typhus is believed to be propagated by means of vitiated human effluvia ; and in this view of the disease, the idea of a specific contagion is entirely rejected.)

The few, on this side of the Atlantic, who still advocate the doctrine of febrile contagion, are no doubt actuated by the purest motives ; but their ablest efforts in defence of that doctrine, have no other effect than to betray its weakness, and to evince the power of prejudice in resisting the force of truth

For a full and satisfactory exhibition of the proofs of the incommunicable nature of yellow fever, we must refer to the pages of Rush, Miller, Mitchill, Pascalis, Watts, the Jacksons, Potter, Irvine, Waring, Bancroft, Devèze, and of those of almost every writer on the subject, who has recently been conversant with the disease in the United States and the West Indian Archipelago.

It is true, the physicians of Spain, with some exceptions, who have had many opportunities of witnessing the ravages of yellow fever, entertain opinions diametrically opposite to those generally received in America. This discrepance is no less curious than extraordinary. The Spanish accounts of the disease, so far as they relate to the manner in which it appears, and spreads from one part of a city to another, perfectly accord with the phenomena observed in the cities of the United States. But the inferences of the Spanish physicians in regard to contagion, we are convinced from their mode of reasoning, are entirely erroneous. They appear to have no distinct idea of that which we consider an established truth; namely, that a pestilential miasm, generated by local impurities, and slowly extended from its source, is the primary and essential cause of the disease. They ascribe all the cases, which occur within the circle of a miasmal atmosphere, to a specific contagion; and seem to be ignorant of, or to disregard the fact, that the miasm, like the morbillous and other gaseous poisons, may attach itself to merchandise, clothing, &c., and be thus conveyed, sufficiently concentrated, to produce disease in persons distant from the place of its origin.

We are aware that the opinions of the physicians of Spain are approved and advocated by many in other countries of Europe. It is believed, however, that if favourable opportunities for observing

and studying the phenomena of yellow fever, were presented to the enlightened physicians of England and France, they would soon perceive the error of imputing the disease to contagion.

In order to exhibit the principles upon which we propose to arrange the remote causes of febrile and epidemic diseases, it is necessary to notice some of the arguments which disprove the hypothesis of febrile contagion.

Few propositions in pathology are more evident, than that the contagious property of a disease is essential to the *existence* of that disease; and that, so long as the specific character of the disease continues, so long its contagious property continues. Now, the supposition that one case of yellow fever, plague, or any other species of fever is contagious, and another noncontagious, is wholly gratuitous. If one case be communicable, then all others of the same kind must possess the attribute of contagion.

Dr. Hancock, whose work on the laws of pestilence, published in 1821, contains many interesting arguments in favour of the local origin of malignant fevers, though unwilling to abandon entirely the theory of contagion, has taken a novel view of the subject. After an elaborate inquiry he comes to the conclusion, "that contagion is generally weaker and slower in its operation at the beginning, stronger and more rapid in the height, and nearly exhausted or destroyed at the decline of a pestilential visitation." He holds "contagion, though in a

limited sense, as an incidental property of fever, not an absolute or essential one." The labours of this writer may be regarded as an attempt to reconcile conflicting doctrines ; but, unfortunately, his conclusion, that contagion is weak, strong, and exhausted, at different periods of a pestilential epidemic, is not consistent with the phenomena of contagion, as displayed in the diseases admitted on all hands to be contagious ; and is, also, totally at variance with the facts which have been observed during the prevalence of yellow fever in the United States. It is universally allowed, that the first cases of a pestilential epidemic are usually the most malignant and fatal ; and hence, if contagion really exist, it must act as powerfully at the commencement as at a later period of an epidemic. Besides, if contagion be of incidental occurrence, arising in some cases of fever, and not in others of the same nature, why does not the same thing sometimes happen in small-pox and measles ? But who can conceive of these diseases, passing through their several stages, destitute of contagious qualities ?

But it is urged, that yellow fever and plague do in every instance generate the matter of contagion ; and that, it is owing to the circumstances under which patients are sometimes placed, or the unsusceptibility of the persons surrounding them, that they are not always communicated. It must indeed be confessed, that a disorder truly contagious, does not in every person demonstrate its contagious quality by reproducing its like in others. Facts of

this kind are familiar to every one conversant with small-pox and measles ; but we contend, that when hundreds, labouring under yellow fever, and we believe the same to be true of the plague, are removed from the pestilential atmosphere of a city to the country, to fever hospitals, or to the healthy parts of a town, and are surrounded by their friends and attendants, without communicating the disease to a single individual, we may reasonably call in question its contagiousness. And when to these facts we are enabled to add, that yellow fever epidemics pass away, year after year, without affording a single case which cannot be directly traced to a pestilential district, or to fomites removed from it, we must unavoidably consider such an amount of negative testimony, as sufficient to establish the broad and unqualified conclusion, that the disease is totally destitute of the power of propagating itself by contagion.

/ During the period that fevers were generally believed to be personally communicable, the terms *contagion* and *infection* were considered as synonyms ; but were so ambiguously employed, that in referring to the older works, it is frequently difficult to determine, whether they were intended to designate specific poisons, generated by morbid secretory action, human effluvia, or the exhalations from putrefying substances.

(In 1796, Dr. Richard Bayley of New-York, proposed that the term *contagion* be restricted to morbid animal poisons, as those of small-pox, measles,

&c., and that the term *infection* be limited to the pestiferous effluvia arising from the excretions of the sick and other species of filth.* This distinction was soon approved by several respectable writers, and more recently has received the approbation of the profession generally in the United States. European physicians have also perceived its advantages. Dr. Adams introduced a similar distinction in his work on morbid poisons; but without adverting to the prior suggestions of Dr. Bayley. M. Devèze has adopted the same view of the subject, in his treatise on yellow fever, and exhibited with great perspicuity the distinguishing characteristics of contagion and infection. Dr. Armstrong, whose practical illustrations of fevers are justly celebrated, though he insists on the contagious nature of plague and typhus, admits that, “in a certain sense this distinction is assuredly justifiable.”—“An atmosphere,” he says, “may be said to be infected, when it excites fever in those who are exposed to it without communicating an attribute to that fever, by which it can propagate its kind indefinitely from the first to second and third persons. It is thus that marsh and similar effluvia might be termed an *infection*.”)

These attempts to introduce different significations to the words *contagion* and *infection* may be regarded as evidences of a considerable advancement in correct etiological inquiry. The investi-

* See his Account of the Epidemic Fever, which prevailed in the city of New-York, in 1795.

gation, it appears, had progressed to a point, at which it was seen that terms were wanting to distinguish those poisons which are generated by morbid secretion, from those produced by the excretions of the human body and other putrescent materials.

As the principles upon which this distinction is founded are clear and definite, they will enable us to expose, in a strong light, the fallacy of the doctrine of the incidental contagiousness of fevers.

Those who assert that contagion is the first essential of plague, yellow fever, typhus, and dysentery, hold a doctrine which is consistent with itself; but those who admit that noxious exhalations originally produce those diseases, and at the same time contend that they are subsequently propagated by specific contagions, violate an established rule of philosophizing. They have recourse to more causes than are sufficient to explain the phenomena; and, what is equally unphilosophical, maintain, apparently without perceiving the absurdity, that two poisons, essentially different in their nature, are capable of producing the same specific disease. For example, they tell us that a miasmatic poison, arising from the soil, will induce a peculiar form of fever; and that this fever will generate a contagious virus which is adequate to the production of the same disorder in a healthy person. This is obviously making like effects proceed from two very dissimilar causes; surely no one will allege that marsh miasmata possess the

qualities of poisons formed by animal secretion. The fact is, such poisons being different from miasmata, both in their origin and properties, must necessarily produce different diseases.

The poisons of yellow fever and plague, like the exhalations which produce intermittent and remittent fevers, spring originally from the soil. In order therefore to render those fevers capable of communication, it is essentially requisite that the diseased body regenerate and multiply the same kinds of poisons. But it is plain, that the constitution is no more adequate to this, than it is to the regeneration and subsequent exhalation of arsenic or corrosive sublimate when swallowed in doses sufficient to destroy life. The miasm, which is acting efficiently in a case of yellow fever or plague, never extends its influence beyond the patient; and its power is annihilated in the crisis of his disease. Hence we conclude, that all miasmatic diseases are as destitute of contagious properties as the disorders occasioned by the mineral poisons.

But here the interesting inquiry arises, whether individuals sick of a pestilential disease may always be approached with impunity? On this subject we have to remark, that although persons affected with yellow fever, or plague, are not to be avoided on account of any danger of contracting that peculiar form of disease by personal communication, yet as vitiated human effluvia are highly deleterious, there is sometimes danger from this source, especially if there are many patients crowded into small and ill-

ventilated apartments, if no attention is given to personal and domestic cleanliness, and if the disease be protracted to a stage in which the excretions of the body become putrescent and noisome. It has been shown by Dr. Adams, that the poison engendered under such circumstances is not entitled to the name of contagion. It always, when it acts singly, produces typhous fever, of greater or less severity, whether it originates in the places occupied by those sick of plague, yellow fever, typhus, remittent fever, or by one confined with a broken leg. This we regard as a cardinal truth, which should be constantly kept in mind in our etiological researches. In this manner typhus produces typhus; and hence the erroneous conclusion that the disease is propagated by means of a specific contagion.

This error, respecting the contagious quality of typhus, is at once corrected by distinguishing secreted poisons, from effluvia generated by foul excretions. Persons in good health, when long confined in close apartments, will produce a miasm of the same qualities, as that which frequently surrounds the bodies of those labouring under fever. The former has been considered as the primary cause of typhus, and the latter a specific contagion, merely because the first originates from persons in health, and the second from bodies diseased. But there is in fact no material difference between them, as is obvious by their pro-

ducing similar effects. Healthy excretions are, *cæteris paribus*, longer in undergoing the changes which result in the production of the typhous poison than those which are thrown out in putrid diseases. The excreta, in the second stage of typhus and some other fevers are generally in a vitiated or putrescent state at the moment of their elimination; and consequently they so rapidly become pestiferous in a confined situation as to give plausibility to the idea of a specific contagion.

As to the fevers occasioned by the exhalations of the soil, they can have, as before observed, no power of propagating disorders of their own nature; because those exhalations and vitiated human effluvia have different properties and produce different effects; but should persons be exposed to the operation of both poisons at the same time, a new or modified form of disease will be the consequence.

From these observations, it will be perceived, that we admit the facts recorded by practical writers, relative to the propagation of typhous diseases; but explain them differently from those who allege that they are specifically contagious. Exceptions might be made to our reasoning, if it led us to view with indifference those means of checking the prevalence of typhus, which have been so successfully employed for that purpose in the cities of Great Britain. But so far is it from having that tendency, that it impels us to urge upon the me-

dical police of every crowded city, the importance of instituting fever hospitals, as originally proposed and established by the distinguished Dr. Haygarth.

The preceding observations embrace only a few of the arguments which might be adduced to disprove the contagiousness of fevers; but they are deemed sufficient to show the grounds upon which are founded the distinction between *contagion* and *infection*.

It is here proper to remark, that the several authorities we have cited in favour of that distinction are not agreed as to what shall be denominated infection. Dr. Bayley justly observes, that "there exists in nature, and that there ought to be made a distinction between infectious and contagious disorders." He considers typhus and other fevers infectious by means of human effluvia; but does not distinctly advert to the unity of disease which those effluvia produce when they arise from the excretions of patients labouring under different kinds of fever. Dr. Adams confined the term infection to an atmosphere vitiated by human effluvia. M. Devèze used it to designate the exhalations of the soil; and Armstrong admits that these may be called infection. In the following arrangement of the remote causes of fevers we propose to combine the views of these writers; and to consider *infection* as embracing all the febrific agents which originate from the decomposition of dead

animal and vegetable matters. The word *contagions* we shall employ exclusively to signify morbid animal poisons, as those of small-pox, measles, syphilis, &c. Used in a general sense, these terms will serve to designate two important divisions of remote causes.

But there are other and more extensive sources of disease, namely, the vicissitudes of atmospheric temperature and moisture, long-continued heat and cold, and also those secret qualities of the air denominated *epidemic constitutions*. These, with contagion and infection, embrace all the general and efficient causes of epidemic distempers.

No term has hitherto been proposed to express the atmospheric causes of disease. An appropriate word for this purpose would obviously afford a definite means of abstraction and discrimination. We shall, therefore, attempt to supply this desideratum in medical nomenclature. As the words meteor, meteorology, and their derivatives, all have relation to the phenomena of the atmosphere, they naturally direct us to their etymology for the original of a term which may serve the purpose here contemplated. From the primitive ΜΕΤΕΩΡΑ is easily deduced the word *Meteoration*, which appears well suited to designate the insalutary qualities of the atmosphere.

By the terms CONTAGION, INFECTION, and METEORATION, therefore, are to be understood three general sources of disease, each distinct and pe-

culiar in its nature. These divisions may be considered as forming three natural ORDERS, each of which we design to investigate and reduce into Genera and Species.

The *remote causes* of disease are usually divided into predisposing and exciting. This division is undoubtedly founded in nature. Contagion always excites disease; but infection and meteoration sometimes act as predisposing, and sometimes as exciting causes. In illustrating the laws of epidemics, we shall frequently have occasion to advert to their *modus operandi*.

PART I



AN ARRANGEMENT

OF

THE REMOTE CAUSES

OF

FEBRILE AND EPIDEMIC DISEASES.

AN ARRANGEMENT, &c.

ORDER I.

CONTAGION.

CONTAGION is a poison, generated by morbid animal secretion, possessing the power of inducing a like morbid action in healthy bodies, whereby it is reproduced and indefinitely multiplied. Its operations on the system are denoted by phenomena, which are peculiar, and distinctly characteristic.

As contagion always originates in the animal body, and is known to exist only by its effects, there is obviously no other method of dividing it into genera, than by classifying the diseases which it produces. In the systems of nosology contagious disorders are distributed, with other maladies, into different classes and orders; but as these systems are formed without reference to the external causes of disease, they are not calculated to facilitate inquiries into the phenomena and laws of contagious epidemics.

The classification proposed by Dr. Hosack, in his paper on contagion, is the only one which exhibits a natural arrangement of contagious mala-

dies.* In the first division of his classification are included those disorders which are communicable exclusively by contact; in the second, all such as are communicable both by contact and through the medium of a *pure* and *impure* atmosphere. To these classes Dr. Hosack adds a third, in which he arranges plague, yellow fever, typhus and dysentery; diseases, which, he thinks, are communicable only through the medium of an *impure* atmosphere. As his first and second divisions embrace all the varieties of contagious diseases, we shall adopt them as the foundation of the following Genera of the Order Contagion. This arrangement, it will be seen, nearly corresponds with Dr. Chisholm's division of contagious complaints into *apyrexious* and *pyrexious*.†



GENUS I.

CONTAGION COMMUNICABLE EXCLUSIVELY BY CONTACT.

In this genus there is a number of species; but as its diseases, with perhaps one or two exceptions, never assume a febrile or epidemic character, we shall merely notice them. In accordance with Dr.

* See the American Med. and Philo. Register, Vol. II. p. 14, also the Transactions of the Literary and Philosophical Society of New-York, Vol. I.

† See the American Med. and Philo. Register, Vol. II. p. 121.

Hosack's classification, the *poisons* of the following diseases may severally be regarded as *SPECIES*, viz.

The Itch,
Syphilis,
The Sibbens of Scotland,
The Laanda of Africa,
Frambæsia or Yaws,
Elephantiasis or Leprosy,
Hydrophobia, and
Vaccina.

“Neither of these diseases,” says Dr. H. “can be communicated in any other way than by *contact*; they are, therefore, contagious diseases, in the strict etymological sense of the term. It is also to be remarked that these diseases are never conveyed through the medium of the atmosphere; actual contact alone can communicate them from one person to another.”

GENUS II.

CONTAGION COMMUNICABLE BOTH BY CONTACT AND BY THE ATMOSPHERE.

The disorders arising from this Genus are distinguished by their febrile character, and by their prevalence as epidemics in certain states of the atmosphere. This circumstance renders them highly interesting in a philosophical point of view; and we think it furnishes a hint, whereby the question of their origin, *de novo*, may be elucidated.

This subject we shall investigate in our inquiry into the laws of epidemics.

The *poisons* belonging to this Genus, and which form distinct SPECIES, are those of

Small-pox,
Measles,
Chicken-pox,
Scarlet Fever, and
Hooping-cough.

To these Dr. Hosack adds Influenza and Cynanche Maligna; but the former is evidently not contagious, and the latter is either a modification of scarlatina, or an atmospheric disease, as we shall endeavour to show in the sequel.

Dr. Hosack observes, that “contact, or *the close approach* to the sick, labouring under these diseases, will communicate them to those who are susceptible of their influence, but they are no less communicable through the *medium of the atmosphere*. A *second law*, which governs this class of contagious diseases, is, that they are communicable in every season, in the heat of *summer*, as well as in the cold of *winter*, in a *pure* as well as in an *impure* air, though more readily by the latter than the former.* A *third law* of communication in this class of diseases is, that the persons afflicted with them are not generally susceptible of a second attack. I say *generally*, because exceptions are related upon very respectable authority.”†

* We know of no facts which warrant this remark.

† American Medical and Philosophical Register, vol. ii. p. 13.

ORDER II.

INFÉCTION.

INFÉCTION is a febrific agent, produced by the decomposition of animal and vegetable substances. It usually exists in the state of a gas or *miasm*, and in this form occurs in filthy houses, ships, jails, hospitals, and cities ; and also in marshes and fenny and low districts of country. Under the denominations of *marsh* or *paludal miasmata*, *exhalations of the soil*, *vegeto-animal effluvium*, *malaria*, *human effluvia*, *febrile* and *putrid contagion*, its various specific effects are detailed in the works of practical writers.

The infectious miasms are considered as arising from decomposing animal and vegetable substances; first, because some of these always exist in the localities where they originate, and secondly, because there is no evidence that any other species of matter are capable of producing them.

Those who contend that contagion is the first essential of plague and yellow fever, argue, that if these diseases were produced by the exhalations from dead animal and vegetable matters, they would more frequently occur where there are offensive collections of putrefying substances. But this reasoning is by no means satisfactory. It

should be recollected that the qualities of the effluvia exhaled from putrescent substances may be diversified by a variety of circumstances; and particularly by the kind of materials undergoing corruption, their proportions, state of mixture, and degrees of temperature and moisture. The secret influences of the atmosphere too, especially those which favour the prevalence of pestilential epidemics, may be supposed to have an agency in varying the properties of miasmata.

The cuticular and other excretions of the human body, which are properly classed with animal matter, are generally believed to produce virulent miasms, only, however, when placed under peculiar circumstances. Now, if this be true, why may not other forms of dead animal matter, either alone or combined with vegetable matter, emit malignant effluvia, when placed under circumstances which are different, but equally peculiar.

The experimental inquiries of Dr. Gaspard* and M. Majendie† evidently tend to show the identity of pestilential infection and the deleterious emanations from putrid substances. These gentlemen have proved, that both putrescent animal and vegetable matters, when injected into the blood-vessels of the

* *Mémoire Physiologique sur les Maladies Purulentes et Putrides, &c.* Par B. Gaspard, M.D. *Journal de Physiologie*. Jan. 1822. *American Med. Recorder*, vol. vi. p. 101.

† *Journal de Physiologie*, Janvier, 1823. *Am. Med. Recorder*, vol. vi. p. 672.

inferior animals, occasion phenomena, strikingly analogous to those exhibited in the human subject labouring under malignant fever.

With respect to marsh effluvia there has generally been no question as to the kind of materials which produce them. Dr. Ferguson, however, thinks they have no connexion with the *putrefaction* of vegetable substances.* Though the facts urged by this writer in support of his opinion are extremely interesting and valuable, yet we cannot consider them as invalidating the arguments in favour of the vegetable or vegeto-animal origin of marsh malaria. Dr. Ferguson observes, that “one only condition seems to be indispensable to the production of the marsh poison; and that is, the paucity of water, where it has previously and recently abounded.” He accordingly thinks that the poison is generated at a highly advanced stage of the drying process; but with regard to the substances from which it emanates, he conceives we are entirely ignorant. That certain degrees of moisture are necessary to the production of the poison is a fact universally acknowledged; but as neither water alone, nor the mineral substances which constitute the basis of marshy grounds, or both combined, can be supposed to generate miasmata, and as in every situation where these appear,

* See his Essay on the Nature and History of the Marsh Poison. Philadelphia Journal of the Medical and Physical Sciences, No. xiii. from the Transactions of the Royal Society of Edinburgh, vol. ix.

dead animal and vegetable matters exist in greater or less quantity, either strewed on the surface, or mixed with the soil, we may reasonably conclude that the marsh poison is derived from the materials to which it has commonly been attributed.

To render this conclusion more obvious, we add, that the mineral ingredients of the soil possess no corruptible qualities; and there are no facts to prove that they are ever converted into febrific effluvia. But with respect to dead animal and vegetable substances, we have incontestable evidence that they emit effluvia which produce fevers. Now, there is perhaps no variety of soil on the earth, except in arid sandy deserts, and the higher polar regions, which does not contain more or less putrescent organic remains. When we advert to the immense number and variety of insects, worms, and reptiles, and the animals of a higher order which are constantly perishing and mingling their elements with the mineral constituents of the soil; and when we observe like phenomena occurring in the vegetable creation, the largest trees, and all the inferior plants sinking into the same common grave, we cannot avoid the belief, that it is to such materials we must look for the origin of miasmatal exhalations.

The smaller animals, and the vegetables which most readily undergo disorganization, are found in the greatest abundance in flat and marshy countries; and this appears to be one reason why such places are so prolific of unwholesome exhalations.

The sickly localities described by Dr. Ferguson, in which he says nothing was perceptible to the sight or smell indicative of vegetable putrefaction, affords no certain proof that disease did not arise from this source. Had the soil of those localities, or of places in their vicinity, been turned up and analyzed, sufficient putrescent matter would doubtless have been discovered to account for the existence of miasmata.

In general the miasmal poisons possess no sensible qualities; and it is probable, that the exhalations, from putrefying substances, which are manifest to the sense of smell, are rarely or never productive of fevers. These exhalations are formed in the first stages of putrefaction; and hence we are inclined to think, that the febrific miasms are formed at a later period of the decomposing process; that is, after the corrupting materials have ceased to emit sensible effluvia. In this view of the subject, however, we are not to suppose, that there is not often a mixture of materials in different stages of decomposition, and consequently that miasmal poisons may be accompanied with vapours offensive to the smell. This is frequently the case in cities and on the margins of stagnant waters.

As all the varieties of organic matter are resolvable into a few elementary principles, the chemical relations of which have been extensively investigated, it would seem that the composition of the deleterious gases emitted from putrefying

animal and vegetable substances might easily be discovered; but the fact is, the composition of miasmata is a problem so difficult of solution, that even their existence in the atmosphere has never been demonstrated by chemical experiment. Many of the circumstances, however, in which they originate, are readily distinguished. These we shall notice as we proceed in the reduction of Infection into Genera and Species.

GENERA OF INFECTION.

The late Dr. Edward Miller, of New-York, in his "Attempt to deduce a Nomenclature of certain Febrile and Pestilential Diseases from the nature and origin of their remote causes," published in 1804, divided the miasmatal poisons into two species; the first, comprising the exhalations of the soil, and the second, the effluvia generated by personal and domestic filth. These noxious principles, he says, "must be considered as gaseous fluids floating on the surfaces, or surrounding the bodies, from which they are respectively exhaled; and hence, like the ethereal fluids of magnetism and electricity, they may properly be called *miasmatic atmospheres*."

"In order to distinguish these two *miasmatic atmospheres*," he observes, "and, at the same time, to duly fix in the mind the impression of the origin and production of them, it is judged expedient to designate each by terms which will invariably express the process of nature in their formation. As

the Greek language has been generally resorted to in the framing of scientific nomenclature, I shall employ the adjective *κοινος*, *common* or *public*, to denote one species of miasma, and *ιδιος* *personal* or *private*, to denote the other. The application of these terms will be readily understood. That portion of air charged with miasmata, exhaled by solar heat from the surface of swampy grounds, or from masses of filth overspreading the open area of cities, according to this distinction, is denominated *Atmosfera koino-miasmatica*. And that other small portion of air, contaminated by miasmata emitted from and surrounding the body, clothes, bedding, and furniture of persons immersed in the filth of their own excretions, and of those associated in the same family with them, accumulated, long retained, and acted upon by animal heat, is denominated *Atmosfera idio-miasmatica*!""*

Next to the distinction between contagion and infection, we consider the arrangement and terms proposed by Dr. Miller as the most valuable improvement which has been made in the classification of the remote causes of febrile diseases. Sir Gilbert Blane, in his *Elements of Medical Logic*, published in 1819, makes a similar division of the infectious poisons, but with pathological views, very

* In deducing his Nomenclature of Fevers, Dr. Miller remarks, "that the two kinds of poison, just described, will produce corresponding kinds of febrile disease, one of which may be distinguished by the title of *Pyrexia Koino miasmatica*, the other by that of *Pyrexia Idio miasmatica*." *Med. Works*, p. 193.

different from his distinguished predecessor. The terms selected by Dr. Miller are so well fitted to designate certain generic divisions of Infection, that we shall employ them for this purpose; but with such abbreviations as will render them better adapted to general use. "My best wishes," says Dr. Rush, "attend the adoption of those terms!"*

GENUS I.

KOINO MIASMA.

This genus comprehends the effluvia exhaled from the public filth of cities, and from the soil of marshes and campaign countries. It also properly includes the noxious emanations from animal and vegetable substances which are accumulated and allowed to putrefy in cellars, storehouses, and the holds of ships.

A high range of atmospheric temperature, and the immersion of the corrupting materials in a certain degree of moisture, are essentially necessary to its production. It is diffused through the common atmosphere; and when extended over a wide area, involving a great number of individuals, it occasions a general prevalence of disease, or in other words, produces *epidemics*.

In this genus are arranged the miasms which

* Med. Inquiries and Observations, vol. iv. p. 144, Edit. 4th.

induce plague, yellow fever, remittent and intermittent fevers ; diseases, for the most part, peculiar to tropical countries, and to the warm seasons of the temperate latitudes.

GENUS II.

IDIO MIASMA.

This miasm is produced from the matter of perspiration and the other excretions of the human body, accumulated in small and unventilated places, and acted upon by heat. It occurs most frequently in the houses of the poor, and the apartments of the sick, and especially of those labouring under the typhous state of fever. It is commonly distinguished in the books by the terms vitiated human effluvia, typhous and putrid contagion.

This poison is the source of genuine typhus, such as jail, hospital, and ship fevers. None of these forms of disease can be said to occur epidemically ; for the miasm becomes innoxious when diffused in the atmosphere a few feet beyond the apartments in which it is engendered. It is extremely rare that the general atmosphere of a city becomes pestiferous from human effluvia.

The fevers, produced by *Idio miasma*, are also distinguished from those arising from *Koino miasma*, by their appearing generally in the middle and higher latitudes ; and for the most part in the

colder seasons of the year ; that is, during the period that houses are generally crowded, and not freely ventilated, owing to the inclemencies of the weather.

The preceding genera comprise all the infectious sources of fever. But it will be observed that Dr. Miller's classification and nomenclature do not provide for that combination of the two miasmatic poisons, which produces compound fevers. He was aware, it appears, of this circumstance, for he remarks, "it would be a subject of curious and interesting inquiry, how far these different febrile poisons are susceptible of being blended, and thereby of producing effects of a mixed kind ; and likewise how far the Idio miasmatic atmosphere, by means of high solar heat and other concurring circumstances, is capable of conversion into the Koino miasmatic atmosphere."* Such a conversion we regard as impossible ; for there are surely no circumstances which can enable simple human effluvia to produce any other forms of fever than the species of genuine typhus. The effects arising from the union of those atmospheres are unquestionably always of a mixed kind.

We have said that idio miasma is most prevalent in the winter and spring, and koino miasma in the warmer months. The miasm of typhus, however, may exist in every climate, and in every season of the year. When it unites with the exhalation from

* Medical Works, p. 196.

marshes, or the public filth of cities, we may conclude, *a priori*, that the effect will be neither idiomiasmal, nor koino miasmal, but one of a peculiar or mixed character. This compound source of disease, therefore, is highly interesting, both in a practical and scientific point of view; and is, we think, sufficiently distinct and well characterized to be ranked as a *Genus*. And accordingly we shall distinguish it by a compound term formed from the names of the preceding genera.

GENUS III.

IDIO-KOINO MIASMA.

This genus may be defined the combination of human effluvia with the exhalations of the soil; or in other words, the intimate union of the species of the first Genus of *Infection* with those of the second, producing virtually a *tertium quid*.*

As this source of disease has never received that particular consideration which its importance deserves, we deem it proper in this place to give such illustrations of its morbid effects as will tend to establish its claims to generic distinction.

* Whether the different miasms in this combination are merely in a state of mixture, or chemically united, it is impossible to decide. Is not the compound analogous to those active remedies which are formed "by combining medicines which excite different actions in the stomach and system, in consequence of which NEW or modified results are procured?"—*Paris's Pharmacologia*.

And first, let us suppose the circumstances in which typhus originates to occur in summer, such as the crowding of individuals into small apartments, badly ventilated, and rendered offensive by personal and domestic filth. These causes would obviously produce typhus in its ordinary form. But suppose there exist at the same time those exhalations which occasion plague and yellow fever, or intermittent and remittent fevers. Under such circumstances, we should not expect to see any one of those diseases fully and distinctly formed, but a disease of a novel or modified character.

In this country, several memorable instances have occurred within a few years, which will enable us to exemplify the peculiar agency of *Idio-koino miasma*.

The fever which prevailed in Bancker-Street, New-York, in the summer and autumn of 1820; and the cases of fever admitted into the Philadelphia Alms-House in the same season, were diseases arising from this cause.

The diversity of opinion, which prevailed among gentlemen equally distinguished for their medical learning and experience, relative to the nature of the Bancker-Street fever, evinced that there was something novel in its character, or rather that it was different from the ordinary endemic diseases of our cities. By some it was unequivocally called *yellow fever*, while others with equal confidence pronounced it *typhus*. Of the former opinion were the Committee appointed by the Medical Society

to inquire into the causes and character of the disease. This Committee produced abundant evidence that there existed in Bancker-Street and its vicinity, all the circumstances necessary to produce typhus. They carefully noted the extraordinary number of individuals residing in that district, their poverty, filthiness, and intemperance; and also the foul condition of the streets, courts, and alleys.*

In deducing their conclusions, it appears they proceeded on the assumption, that the causes of typhus are never operative but in winter; and consequently that the fever of Bancker-Street had nothing of the typhous character, but being malignant, and occurring in summer, could be no other than the pestilential *yellow fever*. It is here we think they erred; on the other hand, those who contended that the disorder was *typhus*, apparently forgetting that *koino miasma* was acting at the time, and which, conjoined with the influence of a high atmospheric temperature, was producing bilious remittent fevers in other parts of the city, were betrayed into an opposite error.†

* See Report of the Committee of the Medical Society of the city and county of New-York, explanatory of the causes and character of the Epidemic Fever, which prevailed in Bancker-Street and its vicinity in the summer and autumn of 1820.

† For the medical history of this disease, we must refer to the Report of the Committee, and to the Inaugural Essay of Richard Pennel, M.D. who treats of the disease under the name of Bilious Typhus. The following, however, we may notice as its principal

Upon a careful review of all the facts connected with this subject, we think we are warranted in concluding, that the fever of Bancker-Street was neither genuine typhus nor bilious remittent, or yellow fever; but a distinct and compound fever, illustrative of what Dr. Miller considered the "interesting inquiry how far the different febrile poisons are susceptible of being blended, and thereby of producing disease of a mixed kind."

symptoms; viz. pain of the head and limbs; pulse excited, but variable in fulness and strength; heat of skin; frequent turgescence of the vessels of the eye; unusual gastric tenderness, occurring early in the disease; nausea and vomiting of bilious matter; tongue white, or brown and dry, sometimes clean and moist; yellowness of the eyes and skin; occasionally a subsidence of animal heat for some hours before death; petechiæ; sometimes hemorrhage; hiccough, and in a few instances, dark-coloured or black vomit. The disease generally exhibited the remittent type.

As to the causes, the Committee state, that the population in the sickly quarter of Bancker-Street, amounted to 1566; and further, that in August there were residing on 30 lots* in this street, 234 families, consisting in all of 1096 individuals; and that of this number 842 resided on 20 lots, 542 on 10 lots, 144 on two lots, and 81 on one lot. In Lombardy-Street, one small lot is said to have been occupied by 24 families. Other parts of this district were also extremely crowded. The Committee correctly observe that "living in crowded dwellings in the vicinity of putrefying vegetable and animal matter, will inevitably dispose to malignant fever: and such causes and similar circumstances have existed in Bancker-Street and its vicinity." From the middle of August to the end of October, the number of deaths in this district was about 150.

* By a lot is meant a piece of ground, 100 or 150 feet long, and 25 or 30 feet broad.

An attentive perusal of Dr. Klapp's paper on the cases of fever received into the Philadelphia Alms-House, in the summer of 1820, can leave no doubt as to the identity of the disease described by him and the Bancker-Street fever. A difference of opinion prevailed for a short time among the physicians of that city in respect to its nature. "The principal determinations," says Dr. Klapp, "were to the head and stomach. In the latter respect there was a difference from ordinary typhus; and from its being a symptom common both to it and yellow fever, some were at first disposed to believe them the same. This opinion, however, obtained to a very limited extent, and I believe in the latter part of the season, when all had an opportunity of contrasting them, the opinion of their identity was relinquished by every one."* The etiology of this disease so well corresponds with that of the Bancker-Street fever, that there can be no hesitation in ascribing it to the agency of *Idio-koino miasma*.

The same disease re-appeared in Philadelphia in 1821, an excellent account of which is given by Dr. G. Emerson. He tells us it was "distinguished by *novel characteristics*," and hence, he remarks, "it is natural for us to search out new causes."† It affords, we think, one of the best examples of an *Idio-koino miasmatic* fever. Its origin and charac-

* American Medical Recorder, vol. iv.

† Phil. Journal of the Med. and Phys. Sciences, No. 6, p. 193.

ter, as detailed by the author, clearly establish this opinion.

It is remarkable, that this peculiar form of fever, both in New-York and in Philadelphia, was, under similar circumstances, more prevalent and fatal among blacks than whites. Indeed, so generally was this observed, that it obtained the popular name of Negro fever. Was this difference owing to the more depraved habits of the blacks? or is the constitution of the negro naturally more obnoxious to the influence of *Idio-koino miasma*, than that of the European and Anglo-American? This question is curious, and worthy of particular investigation. With respect to the diseases produced by some kinds of infectious effluvia, there is a decided immunity in favour of the blacks.

Both koino miasma and idio miasma are frequently engendered on board of ships. "Vessels abounding in animal and vegetable filth, and navigating the warm latitudes, on arriving in port during a hot season, will be apt to generate the former species of miasm, while such as sail on long voyages, and are crowded with passengers, who neglect, or are deprived of the means of cleanliness and ventilation, will be chiefly liable to produce the latter."* The simultaneous generation, and consequent union of these poisons on ship-board, will induce a disease similar to that of Bancker-Street. Several interesting examples of

* Miller.

this kind might be adduced. The same form of disease has been observed to occur in persons who have been exposed to koino miasma on shore, and who are subsequently embarked in crowded ships. Pringle tells us, that "in the autumn of 1757, when our troops returned from the expedition to the Rade de Basque, several of the soldiers were brought into the hospital at Portsmouth, ill of a disorder, *compounded of the bilious and jail fever*. For when those men, upon being seized with the common fever of the season, were confined to the holds of the crowded transports, their distempers assumed a malignant form."†

The observations of Pringle on the *Morbus Hungaricus*, render it probable that the disease derived its peculiarity from *Idio-koino miasma*. He considers it a distemper "not thoroughly known." In many respects it resembled the fever of Bancker-Street. "It is described," says he, "as a malignant fever, attended with sickness at the stomach, a pain and hardness about the epigastric region, great thirst, a parched tongue, and a constant headache, ending in a delirium. These were the common symptoms, to which were generally added petechial spots or blotches." Of the causes he remarks, "as I have read no author who was an eyewitness, I shall take the liberty to infer from this account which we have from Sennertus, that the Hungarian disease was a *compound of the bilious and hospital*

* Observations on the Diseases of the Army, p. 310.

fever, taking its rise in the camp, but acquiring that high degree of malignity from the foul air of the places in which the sick were crowded."

The facts recorded by Thucydides, of the pestilence of Athens, obviously lead to the conclusion, that it was produced by *Idio-koino miasma*.

We are told that during the invasion of the Athenian territories by the Peloponnesians and their Allies, the people of Attica took refuge within the walls of the Capital; that the city was unable to receive so large a conflux of people; that many were forced to lodge in the turrets of the walls; and that a great part of the Piræus was portioned out to them for little dwellings. "Besides this reigning calamity," says Thucydides, "the general removal from the country into the city was a heavy grievance, more particularly to those who had been necessitated to come thither; for as they had no houses, but dwelt all the summer season in booths, where there was scarce room to breathe, the pestilence destroyed with the utmost disorder, so that they lay together in heaps, the dying upon the dead, and the dead upon the dying. Some were tumbling over others in the public streets, or lay expiring round about every fountain, whither they had crept to allay their immoderate thirst."* "So urgent was the necessity," to use the language of Dr. E. H. Smith, "that contrary to the express prohibition, as it was supposed, of the Pythian Oracle,

* Smith's Translation, vol. i. p. 166.

they seized upon the interdicted ground of the Pelasgic, and erected there their miserable huts. Set up wherever space was found, in the utmost disorder, and pressed together, they experienced no free circulation of the air, while their diminutive size provoked the sallies of a sarcastic poet, (Aristophanes) who compares them to butts or casks.”* The population of the city at this time, is supposed to have been augmented from fifty thousand to more than four hundred thousand.

When all these circumstances are duly considered, there cannot remain a doubt that vitiated human effluvia, and noxious exhalations from public filth, in a word that *Idio-koino miasma* was generated and rendered in a high degree malignant.

That this was the cause which threatened to depopulate Athens, is also rendered probable from the nature and character of the disorder, which, it appears, materially differed from the ordinary plague of the Levant; for buboes and carbuncles are not mentioned as occurring in the disease. It is true, in the most malignant and rapidly fatal cases of plague, those symptoms do not commonly appear; but as many of the Athenians died on the seventh and ninth days, and even after a longer period, and especially as many recovered, it is highly improbable, had they frequently occurred, that Thucydides would have omitted to notice them. We are assured that buboes and carbuncles are found in the

* New-York Med. Repository, vol. i. p. 15.

majority of plague cases ; and hence, if they did not appear, or but rarely, in the epidemic in question, we may safely pronounce it to have been, not genuine plague, but a malignant *Idio-koino miasmal* fever.

This inference, it may be said, is invalidated by the fact, that buboes and carbuncles are noticed by Hippocrates. Seeing, however, that he has made no mention of “the violent heats of the head, the bloodiness of the throat, the sneezings and the hoarseness, the vomitings and the hiccoughs, the plungings into cold water, and despondencies, (to pass by many other particulars mentioned by Thucydides,) circumstances which it was not possible for so curious an observer as Hippocrates to forget or overlook,” we may conclude, that his account of malignant fevers was drawn up, not from the pestilence of Athens, but from observations made in Thasus, Abdera, and other distant places where he chiefly resided.*

The country of Attica is said to be dry and rocky ; and therefore not as subject to plague as Bœotia and some other parts of Greece ; yet as these latter frequently suffered by that form of pestilence, it is reasonable to presume that it occasionally appeared at Athens. If this be true, the declaration of Thucydides, that the disease was unlike any that originated among the Athenians, tends to establish the opinion, that it was different

* Clifton's Preface to Hippocrates.

from the plague. The unprecedented circumstances of the city, producing *Idio-koino miasma*, sufficiently accounts for its novel character. The local origin of this pestilence is, we think, in no point of view problematical. Thucydides was evidently not satisfied with the rumour that it was brought from Ethiopia. "There was then undoubtedly a general tendency to disease over that part of the world. Almost all Attica felt its fury, and Persia, though so distant, partook of the desolation."*

From the above illustrations, it appears that IDIO-KOINO MIASMA is an important febrific agent, and one deserving more attention than it has hitherto received. In looking over the works of practical writers, we have been struck with the numerous examples which might be adduced to show its peculiar character.

Remarks on the foregoing Genera.

Those who are conversant with the practical writers on fevers, must be aware of the difficulty of generalizing the great variety of febrile phenomena described in their works. We are persuaded that no systematic arrangement of diseases, according to their type and symptomatology, will ever be satisfactory to the acute and diligent observer of nature. Such arrangements may be calculated to assist the student in acquiring a general

* Hancock.

knowledge of pathology, but can never enlighten him in the philosophy of epidemics. In order to this, another course must be pursued. He must investigate the causes of epidemics, inquire into the *modus operandi* of those causes, and learn to classify their effects according to their natural affinities.

In the foregoing genera are arranged all the infectious poisons ; and consequently their diseases may be generalized in a corresponding manner. The first genus includes the exhalations which produce plague, yellow fever, and intermittent and remittent fevers ; the second comprehends the miasms, generated by human filth, and from which originate the varieties of genuine typhus ; the third embraces the combinations of human effluvia with the emanations from the soil, which induce compound fevers.

Hitherto we have made no mention of dysentery, the remote causes of which are well known to be principally referrible to the Order Infection.

In general, dysentery is a disease vicarious of certain kinds of fever, and depends upon a peculiar predisposition of the system. It mostly appears in tropical countries, and in the temperate latitudes, during the summer and autumn. It prevails promiscuously with intermittent and remittent fevers, and arises from the same efficient causes. Sometimes the disorder commences as a bilious fever, and subsequently acquires its dysenteric character ; at other times, it begins as dysentery, and

afterward changes to the usual form of autumnal fever.

Dysentery, like other febrile diseases, has long been considered as capable of propagating itself by means of a specific contagion. This error obviously originated from the common observation, that, during the period when soldiers in camp, or the population of a district are predisposed to dysentery, those persons, who surround patients ill of this form of fever, whose excretions are allowed to accumulate in unventilated apartments, frequently sicken with the same disease: but there is surely nothing in this which proves its specific contagiousness. In the majority of cases where the attendants sicken, it is from the same causes which induced the disease of the patient, though in some instances from the noxious vapours generated in his apartment; but in neither case is it certain that they will sicken with dysentery. The form of disease will depend upon the predisposition of the system, and accordingly as this tends to fever or dysentery will the disease be characterized. Besides, it is undoubtedly true, that when there is an epidemic predisposition to dysentery, the attendants on a *typhous* patient, about whom cleanliness is not strictly observed, will more frequently sicken with that disorder, than the one under which the patient labours. This would be impossible, if the supposed dysenteric contagion were specifically different from the miasm arising from the excreta of those affected with typhus.

In both cases the poison is *Idio miasma*, and may induce either form of disease.

The doctrine of Sydenham, that dysentery is a *febris introversa*, is fully established by the facts recorded by Pringle, Cleghorn, Zimmerman, Rush, and a multitude of other writers in Europe and America. Certainly no other evidence can be wanting to show the correctness of this doctrine, than the fact that intermittent, remittent, and dysenteric fevers prevail together in the same locality, are convertible into each other, and evidently arise from the same epidemic influences.

When fever arises from human effluvia, it is always of the typhous character; and consequently when dysentery is induced by that cause, it exhibits phenomena somewhat different from the dysenteric disease produced by marsh miasma. When these poisons co-operate, as is frequently the case in crowded military hospitals and camps, situated in flat and marshy countries, the disease appears in its highest grades of malignity.

From these general observations it results, that dysentery is a vicarious disease, and that instead of arising from one cause, it may be produced by any of the infectious poisons. Thus in cities and rural districts, it arises from KOINO MIASMA; in hospitals, and chambers of the sick, from IDIO MIASMA, or more commonly from IDIO-KOINO MIASMA.

The epidemic predisposition to dysentery appears to depend upon the secret influences of the general atmosphere. These are known to have

the power of modifying the character of miasmatal diseases in different seasons, and at different places in the same season. Autumnal fevers are frequently anomalous, sometimes spending their force on one part of the system, and sometimes on another. Dysentery is a striking instance illustrative of this truth. It is "the fever of the season turned upon the bowels." Its occasional cause is usually a miasmatal poison, and its predisposing or modifying cause, a peculiar influence of the general atmosphere.

It is said that dysentery sometimes occurs epidemically in districts where there are no infectious miasms. If this be true, it must arise from that state of the atmosphere to which we have alluded, concurring with certain other causes of disease, such as the vicissitudes of the weather, improper diet, &c.

SPECIES OF INFECTION.

Although we are entirely ignorant of the nature and chemical composition of the infectious poisons, yet when we observe their effects, it becomes evident that they possess different properties. Dr. Miller remarks, that miasmata may be properly divided into *mild* and *malignant*;* and Dr. Rush ascribes yellow fever to "more active miasmata" than those which produce common intermittent and

* Medical Works, p. 224.

remittent fevers.* Dr. Adams observes, that “the plague originates in towns, ague in marshes; yet there is reason to believe both are in part attributable to properties in the soil, though each of its own kind.”†

In the future progress of chemical discovery, it will probably be ascertained that the elements which enter into the composition of the generic infectious poisons are, for the most part, the same; and that they unite in different proportions, and thereby form a number of varieties. This conjecture is warranted by the philosophy of chemistry, and particularly by the doctrine of definite proportions. But as it is impossible at this time to generalize miasmatic poisons according to their elementary constitution, we shall consider their different morbid powers as sufficiently distinctive to characterize them as species.

As the genera of infection comprise both *mild* and *malignant* miasms, they may severally be divided into *two* Species. In order to distinguish these, we shall prefix to the names of the genera the Greek ordinal numeral *πρῶτος*, and the intensive particle *per*, the first to denote the mild, and the second the malignant species. Thus, the first or mild Species of koino miasma will be denominated *Protokoino miasma*, and the second or malignant Species *Perkoino miasma*. In this manner the Species of

* Med. Inq. and Obs. vol. ii. p. 110.

† Inquiry into the Laws of Epidemics, p. 41.

Idio miasma, and of Idio-koino miasma will also be distinguished.*

The Species of Infection might be designated by prefixing or annexing to the generic appellatives, words directly expressive of mildness and malignity ; but we prefer the above specific terms, first, because they are easily pronounced and sufficiently explicit ; secondly, because they are readily formed into adjectives, as *protokoino miasmatal*, *peridio miasmatal*, &c. ; and thirdly, because, should it hereafter be found proper to make intermediate species, we shall be enabled by means of the Greek ordinal numerals to give them appropriate terms.

The history of the individual species will now claim our particular attention.



GENUS I.—KOINO MIASMA.

SPECIES I.

Protokoino miasma.

This Species consists of those exhalations of the soil which are commonly distinguished by the vague term, marsh miasmata ; and which, in the summer and autumn, produce *intermittent* and *remittent* fevers, and also derangements of the intestinal and hepatic functions.

* In framing this Nomenclature, it will be perceived, that we employ the words used by the chemists, to express the lowest and highest degrees of oxidizement.

That this species is different from that which produces yellow fever and plague, cannot be doubted; for were they the same, we should find those diseases as frequently and as extensively prevalent as intermittent and remittent fevers.

Protokoïno miasma is generated in situations where there is putrescent matter immersed in certain degrees of moisture, and acted upon by solar heat. The localities which furnish it in the greatest abundance are filthy cities, marshes, and flat countries. In wet seasons, swampy and low grounds are comparatively unproductive of the miasm, in consequence of being saturated, or inundated with water. In such seasons the dryer and more elevated tracts of country, which are usually healthy, are particularly liable to visitations of miasmatic diseases. "Dr. Dazille, in his treatise upon the diseases of the negroes in the West Indies, informs us," says Dr. Rush, "that the rainy season is the most healthy at Cayenne, owing to the neighbouring morasses being deeply overflowed; whereas at St. Domingo a dry season is most productive of diseases, owing to its favouring those degrees of moisture which produce morbid exhalations. These facts will explain the reason why in certain seasons, places which are naturally healthy in our country become sickly, while those places which are naturally sickly escape the prevailing epidemic."* Dr. Ferguson, in his interesting paper on the marsh

* Medical Inquiries and Observations, vol. iii. p. 103.

poison, corroborates the statement of Dr. Dazille. In performing the duty assigned him of making a medico-topographical survey of the West India Colonies, he observed "that the same rains which made a deep marshy country perfectly healthy, by deluging a dry well-cleared one, where there was any considerable depth of soil, speedily converted it, under the drying process of a vertical sun, into a hotbed of pestiferous miasmata."*

With regard to the degrees of heat and moisture which are most favourable to the formation of *Protokoino miasma*, our knowledge is very limited. A temperature below 35° or 40° of Fahrenheit, or a state of perfect dryness or extreme humidity, may be considered incompatible with its generation. It appears to arise most abundantly from grounds which are undergoing the process of exsiccation, or which are occasionally irrigated, or moistened by showers, and at the same time steadily acted upon by summer heat. Accordingly the margins of rivers, ponds, and lakes, and certain points of savannas and swamps, are deemed more fruitful of miasmata than stagnant waters, or very humid or dry soils.

In cities, the quantity of moisture and filth varies in different places; and consequently it must often happen that some spots will be in a condition more favourable to the production of febrific effluvia than others. Hence it is, that ordinary autumnal fevers

* Philadelphia Med. and Phys. Journal, No. 13.

are frequently observed to prevail most in certain neighbourhoods. The miasm exhaled from such spots sometimes extends over a whole town, and occasions a general epidemic. In like manner, the effluvium from marshes spreads over a considerable space of the circumjacent country, and produces a corresponding prevalence of disease. Sometimes it reaches places somewhat elevated, though its extension in certain directions is generally arrested by mountains, high ridges of land, and dense and lofty forests.

The soil of woodlands is less productive of *Protokoino miasma* than marshes and open flat countries; but the clearing of such lands is frequently followed by fevers. Consequences of this kind are often experienced in the new settlements of the United States. We are told by Dr. Williamson, in his history of North Carolina, that this State "was less sickly before the country was opened. The second colony of adventurers remained twelve months in the country, and they lost only five men out of one hundred and seven, though they were badly sheltered, and suffered much by the scarcity of provisions. A gentleman in Craven county lived on his farm above forty years without suffering by intermitting fevers, though his family consisted of fifty or sixty persons. There was about one hundred acres of clear ground in front of his house that had been cultivated many years; but there was a thick wood behind the house. In the beginning of the year 1785, he caused all the timber and shrubs that

were behind his house, within four or five hundred yards, to be cut down. His object was pasture and a free circulation of air. One-third of his family, in the next summer, was taken down by intermitting fevers. Such complaints were not more prevalent than usual during that summer in other parts of the flat country. Those fevers were certainly caused by exposing to the sun a large surface of fresh land covered with putrescent vegetables. Similar effects are very common in the West Indies, where they are fatal to such a degree that soil newly turned up is supposed by the planters to contain some pestilential quality." These facts are the more interesting, as they will frequently account for the appearance of remittent fevers, in situations which are remote from marshes and low grounds, and which are generally healthy.

Dr. Ferguson remarks, that if there be a remedy for malaria "it must be found in the powers of cultivation, ever opening the surface for the escape of pestilential gases, and exhausting the morbid principle by a constant succession of crops; for wherever malaria prevails, the uncultivated savanna, even though used for pasture, becomes infinitely more pestiferous than the plantation."

Protokoino miasma is supposed to be specifically heavier than common air; for it extends along the surface of the soil to a considerable distance from its source, and is always most active in low situations. It appears to form a stratum, resting on the earth, which, like other vapours, may be agitated

and dispersed by the winds. Its ascent in the atmosphere is varied by the rarefying influence of the solar heat. Thus, during the day it is elevated, but at night is condensed and descends with the dew. Hence the danger of sleeping on the earth, or in tents, and the greater salubrity of the upper stories of buildings. These observations will in part explain the fact, that, as the season advances, miasmatic fevers multiply. The heats of summer, though more favourable to the production of the poison, are less so to its concentration, than the temperature of autumn.

It is questionable whether *Protokoïno miasma* can be conveyed, in the form of *fomites*, from one place to another. As its powers are comparatively feeble, it is probably never or but rarely productive of mischief if thus transported. Dr. Hancock thinks, that "a blanket folded up in the midst of an extensive ague marsh, might communicate an intermittent to one predisposed, a considerable time after."*

The period within which persons are most liable to sicken, after exposure to the poison in question, is not determined with accuracy. In respect to this, much depends, no doubt, upon the mode of living, peculiarity of constitution, and the action of secondary or exciting causes. The careful avoidance of these causes is the only effectual method of preventing an attack. It is remarkable, that the predisposition induced by this miasm continues

* Researches into the Laws and Phenomena of Pestilence.

longer than that occasioned by any other species of infection. Persons frequently sicken with intermittent and remittent fevers several weeks, and even months, after the poison has ceased to exist, or after their removal from its source. Such also as have suffered by intermittents in the autumn, are subject to their recurrence in the following winter and spring.

Different countries, and different localities in the same country, probably furnish VARIETIES of the species *Protokoino miasma*; but of their number and qualities, no satisfactory account can be given. Whether the common effluvia emitted from the soil and filth of cities possess the same properties as those exhaled from marshes, is uncertain. Remittent fevers prevail alike in both situations, and require the same general treatment; but intermittents are more rife in the country. In cities, the moisture is less, and the heat greater than in marshy districts. These circumstances doubtless have some effect in varying the type and character of diseases; but do they account for the greater prevalence of agues in the latter than the former? or is the difference owing to certain modifications of the miasm?

But though this poison may vary in its qualities in different places, the pathology of its diseases is every where the same. The apparent diversity in its mode and force of action, principally arises from the diatheses of individuals, the varieties of climate,

and certain epidemic influences of the general atmosphere.

In all countries, and especially in hot climates, the fevers occasioned by *Protokoino miasma* are sometimes attended with black vomit, and yellowness of the eyes and skin; circumstances which have led many observers to consider them of the same nature as the pestilential yellow fever, differing from it only in grade. This error has long been associated with doctrines otherwise true. In the West Indies, there is probably much difficulty in distinguishing the worst cases of *malignant* bilious fever from genuine yellow fever. To judge correctly, where there is any doubt relative to the nature of a febrile disease, several cases, occurring at the same time and place, should be attentively investigated. If a majority of these cases manifest the signs of bilious remittent fever, they should be regarded as distinct from yellow fever, notwithstanding the malignity of some of them; and on the other hand, if in the greater number, the characteristics of yellow fever clearly and unequivocally appear, they should be considered specifically different from *Protokoino miasmatic* fevers.

To this history of the milder *Species* of Koino miasma, we may add, that when viewed in its geographical relations, it is found to be indigenous in most countries of the torrid and temperate zones. During the summer and autumn, it is abundantly produced throughout the alluvial tract which

stretches along the Atlantic sea-board from New-Jersey to the gulf of Mexico. It is also a prolific source of fever in the secondary region, west of the Alleghanies; and in the countries bordering on the great American lakes. In the north-eastern States, the formation of which is for the most part primitive, it is not so general; but in every place where there are swampy grounds, or the country is low and level, it frequently produces epidemics. Some of the more remarkable foreign sources of this poison are the fens of Lincolnshire, the low lands of Holland, and the Netherlands, the marshes of Italy, Hungary, the Indies, and the western shores of Africa. Indeed, next to the morbid influences of the atmosphere, it may be regarded as the most general cause of disease.

SPECIES II.

Perkoino miasma.

This Species embraces the poisons of *yellow fever* and *plague*, the malignant effluvia of Batavia and of some other parts of the East. It is distinguished from the Species *Protokoino miasma*, by its more virulent and pestilential qualities, and by its occurring for the most part in cities. In crowded populations it affects great numbers at the same time, and usually prevails with destructive severity for a period of several months. Among commer;

cial nations, its specific character is acknowledged in their prohibitory measures of quarantine.

Although *Perkoino miasma* may constantly exist at some places within the tropics, yet its *epidemic* appearance, especially in temperate climates, is very irregular. It frequently prevails in the cities of neighbouring countries at the same time, or successively in different seasons. Sometimes, however, there are intervals of many years, during which it scarcely appears in the temperate latitudes.

This poison, like the first species of *koino miasma*, is exhaled from masses of public filth, and soils containing putrescent matter; and is generated under a high range of temperature, and certain epidemic influences of the general atmosphere.

In the United States and the Islands of the Antilles, where the yellow fever is most prevalent, it generally first appears in the lowest parts of sea-port towns; and particularly on the margins of rivers, and about docks constructed of perishable materials. Usually it commences its ravages in a small neighbourhood; and from this gradually extends in every direction, progressing uninterruptedly from street to street, and thus enlarging its circle, until arrested and destroyed by certain changes in the qualities of the atmosphere. Occasionally it appears in several parts of a city, in the same season; but then, always spreads in the manner just stated. Sometimes the grounds from which it emanates are not so narrowly circumscribed, but are of consider-

able extent, especially in tropical climates, and in sea-ports where public cleanliness is neglected.

The source of the yellow fever poison, and the means by which the disease is spread through a city, are well known to be subjects fertile of controversy. In pursuing the history of *Perkoino miasma*, the questions in dispute will properly come under review.

All admit, that in the cities of the middle latitudes, the poison makes its epidemic appearance in the localities above described ; that its field of prevalence widens slowly and regularly from day to day ; and that it spreads, not only through the lowest and filthiest, but occasionally to the higher and more cleanly streets.

These facts have been urged to prove, that the poison of yellow fever is a specific *contagion*, introduced from a foreign source ; and that the extension of the disease is owing to personal communication. This doctrine has but few advocates on this side of the Atlantic, and will no doubt soon be entirely exploded.

The fact, however, is well established, that the agent which produces yellow fever is capable of being transported from one country to another ; and there are strong reasons for believing that it is often engendered in ships while navigating the tropical seas. The frequent arrival of infected vessels from the West Indies, at the sea-port towns of the United States and of Spain, has given a colouring of truth to the hypothesis of exclusive importation.

That the entrance of such vessels into port is dangerous, and often fatal to those who board or approach them, is at present a matter of universal notoriety. But a broad distinction should be made between this source of yellow fever, and that of a pestilential epidemic. Formerly, the anti-contagionists were over anxious to prove that the yellow fever which casually appeared in certain towns of the United States, originated from domestic causes ; but the proofs of its importation, in several instances, are clear and indisputable. Thus the cases which occurred at the Wallabout in 1804, at Perth-Amboy in 1811, at Middletown, Connecticut, in 1819, and at the New-York Lazaretto in 1821, were satisfactorily traced to vessels recently arrived from the West Indies. It seems that the anti-contagionists feared that such concessions would invalidate the doctrine of the domestic origin of yellow fever ; but this can never be the consequence of a fair investigation of the subject. The evidence in favour of the local production of *Perkoino miasma* is no less conclusive than that which establishes its introduction by ships. The following facts are deemed sufficient proofs of its local or domestic origin.

1. The disease frequently appears in the first instance among those who have had no communication with infected ships, goods, or other articles. This fact is abundantly established by the testimony of many respectable American physicians.

2. The disorder prevails as an *epidemic* only in the warm seasons of the year; that is, it commences in summer, and after raging for several months, disappears in the autumn; exhibiting in its course a rise, progress, and decline, like other epidemics produced by miasmal causes. It proceeds in the manner here stated, when there are no suspicious vessels at the wharves, or goods imbued with foreign infection in the town. Moreover, it never spreads beyond the atmosphere of a city, nor is it propagated by the sick when removed to the country, or to the healthy parts of a town—a fact which has given proof that its epidemic prevalence is not dependent upon a specific contagion.

3. The early and entire desertion of an infected neighbourhood or district, and of a wide space around it, does not in the slightest degree tend to stay the extension of the poison, nor to diminish the danger of visiting the uninhabited locality, so long as the weather continues favourable to the existence of the miasm, which is frequently for three or four months. In general there is much greater hazard in walking through the streets originally infected one or two months after the inhabitants have removed, than at the commencement of an epidemic. These facts are in no way reconcilable with the doctrine of contagion.

But it may be asked, in what manner can it be satisfactorily determined, whether yellow fever originates from a foreign or domestic source, when there is a coincidence between the arrival of in-

fected vessels, or the introduction of infected goods, and the commencement of an epidemic.

In some instances it may, on the first appearance of the disease, be difficult to answer this question ; but, in the event, we think, it may be solved with accuracy. If the poison be imported, the disease will not prevail epidemically ; it will affect those only who approach the infected vessels or their cargoes, and will totally disappear on removing them to a distance ; whereas, if the disease be of domestic origin, it will continue to prevail through the season, whether the ships be removed or not—provided the local source of the poison be not discovered and effectually destroyed.

Should infected ships, however, be allowed to remain at the wharves of a city until cold weather, they would undoubtedly so long continue to contaminate the air of their immediate vicinity, and consequently the disease would continue to occur, and perhaps, extend to a few of the adjacent streets. But such experiments are never permitted in the United States or in Europe. As soon as yellow fever shows itself, every thing suspected of containing foreign infection is removed, and of course any poison derived from this source is soon rendered innocuous by dispersion in the atmosphere.

The preceding views of the origin, prevalence, and difference between the imported and domestic causes of yellow fever are naturally presented to the mind on rejecting the doctrine of contagion.

But of late a new hypothesis has been started by a few of those who are fully convinced of the *non-contagiousness* of the disease.

They contend, that yellow fever never prevails in the middle latitudes, unless *Perkoino miasma* be imported directly or indirectly from tropical countries, where it is indigenous; and that, when imported, it is multiplied and extended epidemically, by assimilating something it meets with, to its own nature. But the manner in which this assimilation is effected, or what that something is, which is converted into *Perkoino miasma*, they do not pretend to explain. Their hypothesis is founded on the assumption, that temperate climates are incapable of originating the poison, and that when yellow fever prevails in the cities of those climates, it is always after a commercial intercourse with places where the disease is known to exist.

This doctrine, though possessed of the charm of novelty, is, we apprehend, not more tenable than that of imported contagion. But let us briefly examine its bearings with the principles of sound philosophy.

Does the exotic poison reproduce itself by acting as a ferment:—If so, there must be materials in the city in which it is introduced, of the proper kind to form that particular poison, otherwise it could not be multiplied by an assimilative fermentation. The truth of this proposition will not be questioned; and hence, if it be granted that *Perkoino miasma* originates in the West Indies and

other tropical countries, it follows, that the poison may appear *de novo* in the cities of the temperate zone, whenever circumstances occur corresponding with those in which it is generated within the tropics. Now such a correspondence, it is believed, always happens in the temperate latitudes, where the yellow fever is epidemic. It is correctly observed by Sir Gilbert Blane, that "this fever is restricted to a certain range of atmospheric temperature, never having appeared either on the continent of America, nor in Europe, except in seasons in which the heat of the air is permanently equal to that within the tropics, that is, about 80 degrees of Fahrenheit."*

Inasmuch, therefore, as the elements which enter into the composition of *Perkoino miasma* do exist in the sea-port towns of the middle latitudes, and as in these, the summer and autumnal seasons are frequently characterized by meteorological phenomena which render them in effect tropical, the supposition of an exotic poison reproducing itself by an assimilative fermentation is totally unnecessary to explain the origin of yellow fever epidemics.

But there are other objections to this hypothesis. *Perkoino miasma*, when introduced into the foul atmosphere of a city is said to operate as a spark thrown among highly combustible materials. By this illustration, we understand that the exotic poison reproduces itself by assimilating the impuri-

* Elements of Medical Logic.

ties of the atmosphere to its own nature ; but how can such a process account for the slow and progressive manner in which cities usually become pestilential. The poison emitted from infected vessels and their cargoes, together with the noxious exhalations from the soil, is swept away by every passing breeze, and consequently it cannot gradually extend by a process of assimilation.

But if an assimilative fermentation can really take place, it is obvious, that the air of a whole city would very soon become pestilential ; for the miasm being scattered by the wind through the streets generally, would quickly reproduce itself alike in every quarter. But such occurrences have never been observed ; on the contrary, yellow fever always slowly extends from the locality where it first appears, and frequently several weeks elapse before it reaches the distance of half a mile.

These observations, we think, clearly evince that the poison is not multiplied by assimilating the *impurities of the atmosphere* to its own nature, but that it proceeds from a source connected with the soil over which the winds have no control.

It is admitted that the apothegm, *a little leaven leaveneth the whole lump*, is true, with respect to the chemical changes which take place in various fermenting mixtures ; but in every instance with which we are acquainted, the fermenting materials are in a palpable form. Is there any evidence that free gases ever act as ferments when mixed with other principles in a gaseous state ? It is justly remarked

by a distinguished writer, that we can explain phenomena which are doubtful only by phenomena which are known. Now unless there are instances known in which specific gases assimilate other gases to their own nature, we must regard the hypothesis of *Perkoino miasma* converting the impurities of the air to its nature, as not merely doubtful, but positively fallacious.

The only remaining ground, therefore, upon which the doctrine of assimilation can be defended, is the supposition that *Perkoino miasma* is absorbed by the soil and masses of public filth, and that, when thus combined with corrupting matter, it induces therein a peculiar fermentation, whereby it is reproduced, and exhaled in the same manner as if it were primarily of domestic origin. But as this supposition is purely gratuitous, being unsupported by a single fact, or even by analogy, we are constrained to adopt the unqualified opinion that the yellow fever always originates from a poison engendered in the places where it prevails *epidemically*.

The following summary account of the manner in which *Perkoino miasma* appears and spreads through a city, is taken from the history of yellow fever as it has commonly occurred in temperate climates, and from our personal observation of its prevalence in the city of New-York in the years 1819 and 1822.

The grounds from which the miasm is exhaled, are usually of small extent, compared with the area over which it eventually spreads. At first, the

poison is probably generated in a very minute quantity, perhaps not enough to occasion disease even in those who are the most susceptible to its noxious influence. But the quantity progressively increases, and shortly becomes sufficiently accumulated at and about its source to produce the few cases of fever which form the commencement of an epidemic. As the exhalation multiplies, it spreads to the adjoining streets, producing additional cases. At this period, however, the continuance of the disease as an epidemic, frequently appears doubtful, owing to the wind dispersing the miasm, the quantity of which is yet inconsiderable. But the poison, multiplying from day to day, slowly extends over a larger space, entering the houses, courts, and other retreats sheltered from the winds. As the season advances, the pestilential soil becomes more and more prolific of the poison, and when at length its exhalation is no longer increased, the epidemic soon rises to its height.

In accounting for the extension of yellow fever, it is important to observe, that the quantity of *Perkoino miasma* daily augments, and that the principal cause of its not spreading rapidly with effect, is its dispersion in the atmosphere. The poison in a dilute state is, no doubt, always considerably in advance of the places in which it is sufficiently concentrated to produce disease; and although that portion of the miasm which is diffused through the streets of an infected district, may frequently be scattered by the wind so as to render them com-

paratively safe to passengers, yet as the poison has possession of enclosures and ranges of buildings, and is constantly emanating from its source, they soon become again pestilential in a calm state of the atmosphere. Moreover, it is probable that the miasm is condensed with the dews, and partially absorbed by the soil, from which it is exhaled during the heat of the day. This idea is the more plausible, seeing there is reason to believe that the specific gravity of *Perkoino miasma* is greater than that of atmospheric air, and that its elevation above the surface of the earth is never considerable. It is an old observation that the occupants of the upper stories of houses are less exposed to the ravages of pestilence than those who reside on the ground floors.

The preceding observations principally relate to the poison of yellow fever; but we believe they are equally applicable to the remote cause of the plague. It is true, the two disorders are distinguished by peculiar symptoms, and are somewhat different in their pathology; still they occasionally exhibit similar appearances. Buboes and carbuncles are sometimes observed in yellow fever, and yellowness of the skin, and black vomit in plague. But such phenomena also occur in other forms of fever, and therefore cannot be considered as positively identifying those diseases. Yellow fever prevails in tropical countries, and never in the higher latitudes; whereas plague never appears within the tropics, but is confined to certain coun-

tries of the temperate zone, prevailing sometimes in northern countries where yellow fever is unknown. These dissimilarities seem to indicate an essential difference in the causes of the disorders in question. But when we reflect that climate has a decided influence in modifying the character of diseases ; that plague is a malignant form of fever, and the pestilential scourge of cities ; that it occasionally resembles yellow fever, and prevails in the warm seasons of the year ; and that the laws which govern its rise and prevalence are the same as those of yellow fever, we have the strongest reasons to conclude that the causes of the two complaints, if not precisely alike, are but *varieties* of *Perkoino miasma*.

This conclusion is not impaired by the fact that plague never occurs in tropical countries. It is said, that a high degree of heat destroys the plague poison, and is incompatible with its generation. But if this be the only reason why the disease does not appear within the tropics, we may ask what prevents its occurring in the East Indies, China, and America, where the range of *temperature*, throughout extensive regions, is unquestionably favourable to its prevalence ? The causes to which tropical countries owe their immunity from plague appear to be as inscrutable as those which exempt the United States and the temperate climates of the eastern parts of Asia from that form of pestilence, or which exempt Egypt and Arabia from epidemic yellow fever. In our present state of knowledge,

therefore, we must be content with the general conclusion, that the difference between yellow fever and plague, depends upon certain endemic influences, or modifications of *perkoino miasma*, arising from peculiarity of climate and locality. The opinion that remote countries produce varieties of malignant *miasma* is countenanced by the most respectable medical authorities; and as to the affinity between plague and yellow fever, it is generally acknowledged by those who have devoted themselves to the study of the laws and phenomena of pestilence.

There are facts to prove, that *Perkoino miasma* is sometimes attached in such quantity to clothes, furniture, and other articles, that on removing them from one place to another, as from ship to ship, or from the town to the country, disease has thereby been communicated. With respect to yellow fever, such instances, though rare, explain the origin of some cases which are alleged to have arisen from contagion. Relying on the numerous statements relative to the more frequent communication of plague, in a pure atmosphere, we are inclined to believe that its poison is of a grosser quality than that of yellow fever, and that it more strongly adheres to goods, and the persons and apparel of men.

Perkoino miasma is destroyed by the reduction of the atmospheric temperature to 32° of Fahrenheit. In countries where frost never occurs, its production is suspended by rains, and a comparatively cool

state of the air. In Egypt, the plague ceases during the inundation of the Nile, which commences about the time the north-eastern, or etesian winds begin to blow ; and all writers testify that it disappears in Palestine during the extreme heat of summer, or, as Alpinus says, as soon as the sun enters Cancer, owing probably to the dissipation of moisture, a certain degree of which is essential to the generation of the miasm. Its cessation in these countries is doubtless sometimes owing to some peculiar changes in the secret qualities of the atmosphere, of which we shall treat hereafter.

Whether the yellow fever ever appears, in the first instance, in the interior of a country, is a question which has been much controverted. Yellow fever and plague are kindred diseases, and as we have reason to believe that the latter has frequently originated in the interior of Egypt, Syria, and Europe, why may not the former arise in the interior of America ? On this point, we have the affirmative testimony of Ellicott, Anthon, and Watson,* to which is opposed the negative and gratuitous declarations of those who believe that yellow fever is always imported.† When the towns

* Miller's Works.—New-York Medical Repository.

† There is evidently something in countries bordering on oceans and seas, particularly favourable to the occurrence of pestilence. This remark is no less applicable to the plague, than to the yellow fever. Hodges observes, that “ a pestilential contagion reigns most in maritime countries, and near the sea coasts, because a saline disposition does there most abound, and of the truth of this

recently founded on the great rivers west of the Alleghanies shall have become as populous as the cities on the Atlantic sea-board, it is to be feared their inland situations will afford them no security from the occasional ravages of yellow fever.



GENUS II.—IDIO MIASMA.

SPECIES I.

Protidio miasma.

This miasm is the ordinary source of genuine typhous fever. It is produced from the excretions of the human body in unventilated houses, and in the apartments of the sick. Among the poor in the crowded cities of Europe, it is probably the most productive cause of febrile disease. Its morbid agency is frequently exerted in conjunction with various other causes, such as unwholesome and deficient aliment, the breathing of air vitiated by repeated respiration, vicissitudes of the weather, &c. But the form of disease resulting from the operation of these causes combined, is determined by the quality of the acting poison.

Typhus from *Protidio miasma* is a disease of frequent occurrence in the cities of the United States. In the interior of the country, fevers arising from *this source* are comparatively rare; the maritime parts of our own country do, by sad experience, too much testify.”—*Loimologia*.

but the disorders originating from protokoino miasma, in their advanced stages, often resemble genuine typhus; indeed, the low or *typhoid* state of remittent fever, is doubtless occasioned in part by the morbid excretions of the patient reacting on his system. To this cause also may be partly ascribed the *typhoid* appearances, which are sometimes observed in atmospheric and contagious diseases, the nature of which is originally distinct from that of genuine typhus.*

The atmosphere in prisons, almshouses, and hospitals is extremely liable to contamination from *Protidio miasma*. The poison engendered in such places from crowding, uncleanness, and want of ventilation, not only produces typhus, but has an agency in exciting the cachectic and strumous disorders which are so prevalent in humane and criminal institutions. These diseases are also frequent among the filthy poor, and are in some measure attributable to the same cause.

Typhus arising from the miasm under consideration is in general comparatively mild, the mortality

* As other diseases than those produced by human effluvia frequently assume a typhous character in their advanced stages, would it not be proper if the term *typhus* be applied to such cases, to distinguish that form of disease which originates from *idio miasma* by the denomination of PRIMARY TYPHUS, and that typhoid state of disease which supervenes in the last stages of koino miasm, atmospheric, and other maladies, by that of SECONDARY TYPHUS. These terms would convey a correct idea of those diseases, and imply their original diversity in cause and character.

from it being not materially different from that resulting from an equal prevalence of remittent fevers. In both cases the deaths are few, compared with the recoveries.

That form of typhous fever which sometimes prevails in Lying-in hospitals is commonly imputed to a specific contagion; but in the view here taken of the remote causes of fevers, it must be considered as arising from *Idio miasma*, and generally from its milder species. The greater susceptibility of puerperal women to the effects of this poison, is owing to their irritability and predisposition to fever, induced by pregnancy and parturition.

Although there are no means of distinguishing the varieties of *Idio miasma*, except by the forms of disease produced by them, yet these are sufficiently well marked to justify the division of the genus into species. The same elementary principles are known to produce compounds which possess very different properties.

The fever occasioned by the species *Protidio miasma*, answers in general to Dr. Cullen's description of *Typhus mitior*, and is a disease of less severity than that produced by the malignant species next to be noticed.

SPECIES II.

Peridio miasma.

This poison has the same origin as protidio miasma; but is elaborated under circumstances calculated to increase the virulence of human effluvia to its greatest malignity. These circumstances are usually the long confinement and crowding of individuals into apartments where cleanliness and ventilation are impossible or totally neglected. The violence and malignity of the disease, originating from this source, evince that it arises, from a poison of more energetic powers than that which produces the milder form of typhus.

Jail and ship fevers sometimes originate from this deadly effluvium. The destructive consequences produced by *fomites* at the Black Assizes at Oxford in 1571, and at the sessions of the Old Bailey in 1750, are memorable instances of the effects of this species of infection.

The virulence of *Peridio miasma* is thus spoken of by Lord Bacon, as cited by Hancock. "The most pernicious infection, *next the plague*, is the smell of the jail, where prisoners have been long, and close, and nastily kept,"—"which has some similitude with a man's body, and consists of human flesh and sweat putrefied."*

* Researches into the Laws and Phenomena of Pestilence

Dr. Cullen remarks "that the effluvia constantly arising from the living human body, if long retained in the same place without being diffused in the atmosphere, acquires a *singular* virulence ;"* and Dr. Parr observes that "contagious or infectious matter acquires *peculiar virulence* from confinement with woollens or cotton." The same author appears to have a distinct view of *two species* of *Idio miasma*. He says "fevers caught by *recent infection* are *mild* compared with those which arise from *contagion long pent up, styled fomites* ; and in our experience, very few such fevers have been fatal."† Dr. Parr uses the terms *contagion* and *infection* as synonymous : but his facts in connexion with those cited above, while they fully warrant the division of *Idio miasma* into species, indicate a broad difference between the typhous poison and a specific contagion. The latter is a peculiar virus, completely formed by morbid secretion, and when eliminated from the body can never acquire an additional virulence ; but has a tendency to lose its specific qualities by decomposition. Not so with the miasm of typhus. This being of chemical origin, may change its form, become more virulent, and still retain its generic character.

Peridio miasmal fever may be considered as corresponding with the *Typhus gravior* of authors,

* First Lines.

† Medical Dictionary.

though this term is frequently used to express certain states of fever arising from very different causes.

The modern improvements in the internal economy of jails and hospitals have rendered *Peridio miasma* a rare source of disease. The materials, however, which produce it, constantly exist in some places, in the form of protidio miasm, or human filth adhering to clothes, bedding, and furniture; and all that is necessary to convert those materials into the virulent poison in question, is their long confinement in a situation where the fresh air is excluded, and the temperature is favourable to chemical action.

The relation between the species of *Idio miasma* is similar to that existing between the species of *Koino miasma*; and it is worthy of remark, that some constitutions resist, while others favour the deleterious agency of human effluvia. Hence instances of malignant typhus are sometimes observed among the cases produced by protidio miasma; and on the other hand mild cases sometimes occur where peridio miasma is the efficient cause of disease. Those who are accustomed to breathe *Idio miasma*, are in general the least affected by it.

GENUS III.—IDIO-KOINO MIASMA.

Owing to the compound nature of this genus, it is necessary to point out with particularity the manner in which it admits of being divided into species relatively mild and malignant. In the definition formerly given, it is said to be formed by the combination of the species of the two first genera of infection. It will now be observed, that these species may unite in various ways, and consequently form several compounds. Thus *protokoino* miasma, or *perkoino* miasma, may combine with either *protidio* miasma, or *peridio* miasma; that is, the mild or malignant species of the first genus may unite with the mild or malignant of the second genus. To make each of these combinations, a species would be a useless refinement. Such combinations, however, do undoubtedly sometimes occur, though it is impossible to identify them by their effects. As, therefore, no specific arrangement of the compound miasms can be useful, except that which is applicable to practice, we shall endeavour to make such a division of the genus, as will enable us to generalize all the important facts connected with the etiological history of compound fevers.

Though *Idio miasma* is not as common in summer as in winter, yet when it does exist in the warmer months, it is generally in its milder form. The reason of this is obvious. The ventilation of houses in summer prevents the miasm, arising from

human filth, from acquiring by confinement its highest degree of virulence. The instances in which *peridio miasma* is engendered at this season, are extremely infrequent, and are mostly confined to *fomites* closely pent up, to dungeons, and places where there is an extraordinary and continued crowding of persons within a small space.

It must therefore be the milder species of *Idio miasma* which generally combines with the exhalations of the soil; and accordingly that species may unite with *Protokoino miasma* and *Perkoino miasma*. These combinations may severally be regarded as species, differing materially in virulence; both of which, however, produce severe and malignant forms of fever; but the first is evidently less deleterious than the second. In adopting this arrangement, the nomenclature of the species is made to correspond with those of the other genera.

The division of the Genus *Idio-koino miasma*, here proposed, is the more natural, as an unequal malignity of its species exists, even in the rare cases where *peridio miasma* is a constituent of the compound poison: for example, the *malignant* species of human effluvia, acting with *protokoino miasma*, produces fevers less violent than those occasioned by the co-operation of the *mild* species and *perkoino miasma*. This conclusion, however, is deduced rather from the known properties of the individual species, than from the observation of their action when combined.

SPECIES I.

Protidio-koino miasma.

This Species, being formed by the union of *human effluvia* with *protokoino miasma*, is to be considered mild only when compared with the second of the same genus. Its effects are observed, during the prevalence of remittent fevers, in jails and the filthy habitations of the poor, in camps and military hospitals situated in marshy countries; and sometimes in foul ships crowded with passengers.

When formed in certain proportions, and aided by an unhealthy state of the atmosphere, this poison produces fevers which distinctly exhibit a mixed character, or in other words, which is a compound of typhus and bilious remittent fever. The disease sometimes bears a strong resemblance to yellow fever; but in the majority of cases, judging from what we have seen, it has more of the aspect of genuine typhus.

To determine whether a compound fever arises from this species of infection, we have merely to advert to the character of the fevers which are prevailing among the cleanly inhabitants of the same neighbourhood. If their fevers be ordinary remittents, there can be no hesitation in ascribing the compound fever to *Protidio-koino miasma*. From this source evidently originated the New-York Bancker-Street fever, which we have before noticed. In this instance, the disease was so peculiar.

that some physicians unequivocally pronounced it yellow fever, while others were in doubt as to its nature, or believed it to be typhus. That it was not yellow fever, is proved by the fact that the citizens daily visited the streets, in which the disorder prevailed, without contracting that disease, and indeed without apprehending danger; circumstances certainly contrary to what would have happened, if the streets had been infected with perkoino miasma.

The effluvium, diffused through the common atmosphere of Bancker-Street and its vicinity, was not specifically different from that which contaminated the air of the other parts of the city. The same diseases appeared in that locality among those who lived in clean and ventilated houses, which were common over the whole metropolis. The prevailing poison was *Protokoino miasma*; and the only peculiarity in the general atmosphere of Bancker-Street, consisted in its being more highly inquired by that poison, in consequence of the materials which produce it existing there in the greatest abundance. The compound fever in question was exclusively confined to the inhabitants of houses excessively crowded and filthy. The miasm generated in these abodes of wretchedness, uniting its force with that of *protokoino miasma*, will satisfactorily account for the malignity of the disease, especially when viewed in connexion with the heat of the season. To these causes also may be attributed the compound fevers described by Drs. Klapp and Emerson.

Fevers of a mixed character are not unfrequently observed in the early part of winter. The influence of protokoino miasma on the system often continues for some time after the poison has ceased to exist. Persons thus predisposed, when exposed to human effluvia, generated either in their own houses after the commencement of cold weather, or in hospitals, or transport ships, will be liable to sicken with a disease differing more or less from typhus on the one hand, and bilious remittent fever on the other.

SPECIES II.

Peridio-koino miasma.

Of all the infectious poisons, this possesses the most terrific energy. It is formed by the combination of *human effluvia* with *perkoino miasma*. Its effects are observed in the crowded and ill-ventilated habitations of the poor, during the prevalence of plague and yellow fever. The greater mortality in such epidemics, among the occupants of dirty houses, may be principally attributed to the agency of this compound miasm.

The pestilence which ravaged London in 1665, was called the "*poor's plague*,"—an appellation which appears to have been particularly appropriate; for it is highly probable, that in many parishes, the dwellings of the lower classes of

society were crowded and extremely filthy ; and consequently that the poor were exposed, not only to the prevailing perkoino miasma, but to the idio miasma engendered in their own houses. From the combined action of these poisons, the most calamitous effects were experienced, particularly after the “order was issued out to shut up all the infected houses, that neither relation nor acquaintance might unwarily receive it from them, and to keep the infected from carrying it about with them.” It is said that “the consternation of those who were thus separated from all society, unless with the infected, was inexpressible ; and the dismal apprehensions it laid them under, made them but an easy prey to the devouring enemy. And this seclusion was on this account much the more intolerable, because if a fresh person was seized in the same house but a day before another had finished his quarantine, it was to be performed over again ; which occasioned such tedious confinements of the sick and well together, as sometimes caused the loss of the whole.”* Under such circumstances one cannot be surprised at the fact that sixty-eight thousand died of the pestilence within the period of a few months. The mortality would unquestionably have been immense from perkoino miasma alone ; but when to this was united the idio miasma generated in the houses of the poor, and rooms of the sick, closed and unventilated, the

* Hodge's Loimologia, p. 6, 7. Edit. 1721.

disease acquired additional malignity, and the number of deaths was greatly augmented.

Perkoino miasma no doubt stamped the disease generally with the characters of genuine plague ; but it is reasonable to suppose, that in the crowded and filthy houses, and especially where the sick and well were confined together, and surrounded by the miasm produced from their own excretions, the disease assumed a peculiar character, and a grade of malignity higher than ordinary plague. In such situations the acting poison was not simple perkoino miasma, but the more virulent compound *Peridio-koino miasma*. Human effluvia become harmless when diffused in the atmosphere a few feet beyond the apartments in which they are formed ; hence it is obvious, that the inhabitants who kept their houses clean and well ventilated, were in danger from the general infection only.

Though Sydenham and Hodges do not distinctly show that the character of the disease varied in different classes of society, yet judging from its symptomatology, we may conclude that it was sometimes remarkably modified. That its diversity of character was in many cases owing to the operation of perkoino miasma on one class of the population, and to the action of *Peridio-koino miasma* on another class, cannot be a matter of question. An interesting fact showing the modification of plague by human effluvia, is recorded by Sir James M'Gregor, in his Medical Sketches of the expedition from India to Egypt. "In the

Indian army," he observes, "when the disease first broke out, the cases sent from the crowded hospitals of the 61st and 88th Regiments were from the commencement attended with *typhoid* or *low* symptoms.*

We have said that the pestilence of Athens was produced by *Idio-koino miasma*. This conclusion was deduced from the history of the disease given by Thucydides. That it was a compound fever we inferred from the fact, that buboes and carbuncles were not symptoms of the disease, and that four hundred thousand persons were assembled in the city, which could not conveniently accommodate more than fifty thousand.

We may now regard the disease as having originated from the species *Peridio-koino miasma*, and what is remarkable, it prevailed epidemically; for the whole population must have been exposed to the influence of *idio miasma*, in consequence of the excessive crowding in the houses, turrets of the walls, and the booths erected in the Piræus and Pelasgic. That the human effluvium was combined with *perkoino miasma* is evinced by the extreme malignity of the disease, and by the fact that animal and vegetable substances were accumulated and strewed over every part of the city. Indeed, there can be no doubt, that *perkoino miasma* was abundantly generated, which independently of *idio miasma* would have proved a dreadful scourge.

* Thomas's Practice.

This conclusion derives support from the consideration that pestilence reigned at the same time in the surrounding countries.

In the United States, *Peridio-koino miasma* is not as common a source of disease as in the southern parts of Europe and the Levantine countries of Asia and Africa. In our yellow fever epidemics, however, the disease has been observed to rage most among the poor, inhabiting cellars and houses where cleanliness is entirely neglected.* The visiting of such places is generally considered more

* The following facts, relative to the Epidemic Yellow Fever which prevailed in New-York in 1795, communicated to Dr. Richard Bayley by the Rev. Mr. O'Brien, afford a striking illustration of the effects of *Peridio-koino miasma*.

“As soon as the above causes had produced their malignant effects in the part of the city which was previously disposed to receive them,” says he, “I was constantly employed, insomuch that I might with some truth say, that I lived in the centre of the disease; and for nearly two months never laid in bed one whole night. I found in most places a total want of every necessary of life. *Numbers of poor sufferers, confined in subterraneous apartments, which admitted no light, but from their hatch doors; so that when shut down at night, it might literally be said of them that they were buried alive.* In the progress of visiting the sick, I was much disgusted at the *abominable uncleanly state of their miserable habitations*, and a total want of necessaries: for, in most places, they had not even a stool to sit on, nor a bed to lie upon. On inquiry, I found the much greater part of them to be emigrants of that very summer; insomuch that out of *four hundred and sixty-two* of my congregation who sunk under the disorder, *nineteen-twentieths* were totally unknown to me.” (See *An Account of the Epidemic Fever, &c.* by Dr. Bayley.) Though the great mortality in this Epidemic among the emigrants from

dangerous than entering clean and ventilated houses, or walking through the streets of a pestilential district. This opinion is believed to be well founded, not because perkoino miasma is more concentrated where there is personal and domestic filth, but because the miasm produced from that filth, uniting with the prevailing infection, increases the danger of contracting disease.

It is not supposed that the diseases produced by *Peridio-koino miasma* always exhibit phenomena obviously different from plague and yellow fever. To render these fevers distinctly compound, it is necessary that their character be greatly modified; but their modification may be slight, owing to the quantity of the acting idio miasma being inconsiderable. Besides, perkoino miasma is a poison of much higher virulence than the human effluvia usually combined with it, and may therefore impart to the disease, produced by their joint action, a character more allied to plague or yellow fever, than to typhus. Indeed, the compound fevers arising from *Peridio-koino miasma* do not in general appear to vary so much in their symptomatology from plague and yellow fever, as do the compound fevers produced by protidio-koino miasma from ordinary typhus, and remittent fevers. And the reason of this is obvious; the miasms which

Europe was principally owing to their exposure to *Peridio-koino miasma*, yet their state of predisposition, no doubt, rendered them particularly obnoxious to the disease.

compose the former, differ more in their degrees of virulence than those which form the latter.

Remarks on the Species of Infection.

Having completed the arrangement of the infectious poisons into Genera and Species, we would now be distinctly understood as not intending to advance the opinion that each Species produces a disease as peculiar in its nature as Small-pox or Hooping-cough. The pathological phenomena which result from infection afford the strongest evidence that there is an affinity between its diseases. But this affinity has its limits. The dogma of the unity of disease derives no support from the similitude sometimes observed between different infectious fevers. Strictly speaking, a unity of disease can exist only where there is a unity of cause. If the same poison operate on individuals whose susceptibilities are different, grades of one disease will be the consequence. As a general truth, therefore, it may be said, that different poisons produce different disorders, each of which has different grades that collectively form an unit.

It has long been a question whether yellow fever and plague are essentially different from intermittent and remittent fevers, or grades of the same disease. If our preceding views be correct, the two former must be regarded as specifically distinct from the latter; for yellow fever and plague are produced by the species *perkoino miasma*, while intermittent

and remittent fevers arise from *Protokoino miasma*. These species and their varieties severally produce distinct fevers of various grades. This view of the subject is applicable to all the Species of Infection.

The similarity of the different Species of infectious fevers depends upon the affinity of their poisons, which as it was said before, are probably composed of the same elementary principles varied in their proportions. Now, so far as these poisons are allied to each other, so far only are the fevers occasioned by them grades of the same malady. Though there are phenomena which are common to all the miasmatal diseases, yet there are others peculiar to each, which clearly indicate a specific difference in the poisons that produce them. In every febrile complaint there is an assemblage of symptoms which enables the experienced observer to ascertain its nature, and to discern its relations to other disorders.

In the preceding classification, our object has been to exhibit, in a natural order, the various kinds of miasmata and their combinations, which are distinguishable in their origin and effects. To determine their physical and essential differences is impossible in the present state of science.

The Species of infection and their diseases may be distinguished and arranged according to their various degrees of malignity. Thus the mildest forms of infectious fever are produced by *protokoino miasma* and *protidio miasma*. The disease of the next degree of violence is that arising from

protidio-koino miasma. But the virulence of this poison is inferior to that of *perkoino miasma* and *peridio miasma*, and especially of the former, the existence of which is known by the ravages of yellow fever and plague. The scale of malignity is completed by *peridio-koino miasma*, the effects of which are observed among the poor in crowded habitations in seasons of pestilence.

Several of the preceding species frequently appear in a city at the same time, and consequently produce different forms of fever. This fact enables us to account for the diversity of opinion which has sometimes prevailed in cities relative to the nature of a pestilential disease. Philadelphia, in 1820, suffered from *perkoino miasmal*, *protokoino miasmal*, and *protidio-koino miasmal* fevers. The two latter occurred in New-York the same year.

ORDER III.

METEORATION.

Under this head we arrange all the atmospheric sources of disease, such as the vicissitudes of temperature and moisture, and those occult influences of the air which are occasionally experienced in every climate and season of the year, and which affect in a peculiar manner the animal and vegetable creation.*

Our knowledge of the unhealthy and diversified qualities of the atmosphere is entirely derived from the observation of their effects. Hence in attempting to arrange them into genera, we must be guided by the phenomena which distinguish their different modes of producing disease. The most striking relation existing between the atmosphere and the human body, is that which depends upon the sensibility and insensibility of the latter to the impressions of the former. This twofold relation

* The term Meteoration, being limited in its signification to the morbid qualities of the common atmosphere, has of course no reference to that insalubrity of the air, which depends upon the presence of infectious and contagious effluvia.

An important advantage to be derived from the adoption of this term, is the avoidance of a circumlocution. Its admission into medical nomenclature will ensure accurate discrimination, and afford great facility in general research.

is generally adverted to, in treating of epidemic diseases. Thus some disorders arise from the impressions of the sensible qualities of the air, while others arise from the influence of its insensible or occult properties. Upon these grounds we propose to divide Meteoration into two genera. In the first will be comprised all those qualities of the atmosphere which are manifest to the senses, and this genus we shall denominate *Sensible Meteoration*. In the second will be included all the insensible qualities of the air; and, as these are principally operative in the production of epidemics, we shall distinguish them by the term *Epidemic Meteoration*. The peculiarities of these genera will be exhibited in the following account of their nature and effects,



GENUS I.

SENSIBLE METEORATION.

Sensible Meteoration embraces the diurnal vicissitudes of the weather, and also those manifest qualities of the atmosphere which prevail in different climates and in different seasons of the year. In every country it is productive of disease; and in general, its effects are readily distinguished from those arising from other causes. Among its diseases are catarrh, croup, pleurisy, pneumonia, and other common phlegmasial disorders. The simple and direct effects of extreme atmospheric heat and

cold, are also illustrative of the effects of *Sensible meteoration*. The various states of the atmosphere above alluded to, not only of themselves produce diseases, but frequently act as exciting causes to those disorders which arise from infection and epidemic meteoration.

The *diurnal changes of the weather* affect the human body differently from those *gradual and permanent alterations of temperature* which take place in the transitions of the season. The former consist of sudden variations of temperature and moisture, and immediately cause, or excite disease; whereas the seasons change almost imperceptibly, and instead of producing sudden and powerful impressions on the system, occasion only a modification or change in its diathesis. It is also worthy of remark, that the sensations of heat and cold are relative; that is, the same degrees of temperature produce different impressions on the same person under different circumstances of his system; and the same is true of different persons whose sensibilities are different. These observations hold good in every climate; thus "the cold of 65° or 70° has the same effect in the torrid zone, if suddenly applied while the body is heated by exertion or enveloped in the usual sun heat of 100° or 120°, as that of 32° in northern countries, under similar circumstances."*

The varieties of climate are extremely numerous, and a knowledge of their influence on the system

*.Medico-Chirurgical Review, No. X. p. 370.

is of great importance in the treatment of diseases. The human body has the power of gradually accommodating itself to the *Sensible meteoration* of different countries ; but a sudden change of climate, particularly in passing from high latitudes to tropical regions, is well known to be hazardous, and frequently productive of serious consequences. Among the writers on this subject, Lind, Blane, Mosely, and Johnson, may be mentioned as the most practical and instructive. The latter has ingeniously attempted to explain the manner in which sensible meteoration excites disease of the lungs in northern countries, and of the liver in the intertropical regions. Cold and variable climates, he thinks, occasion disorders of the chest by operating on the skin, and thence on the lungs, by means of what he calls the *cutaneo pulmonic sympathy* ; while the sensible meteoration experienced in hot climates causes functional derangements of the liver, by acting through the medium of the *cutaneo hepatic sympathy*. With regard to the views of this respectable writer, we think he has not given to protokoino miasma the consideration it deserves as an agent concerned in the production of hepatic diseases in tropical countries.

The United States include many varieties of climate, and are subject to sudden and great variations of temperature. Drs. Rush* and Williamson,†

* Medical Inquiries and Observations.

† Observations on the Climate in different parts of America.

and recently Dr. L. C. Beck,* have collected the more interesting facts relative to the climate of this quarter of the globe. Dr. Williamson has ably refuted the assertion of Buffon, Robertson, and others, that the atmosphere of America is unpropitious to the animal and vegetable creation. He has shown that "there is not any vice of the climate, or combination of elements, which prevents the expansion of animated nature, and causes man and beast to degenerate." The climate of our country in many parts, has evidently improved since its first settlement, and as it will doubtless continue to improve, the duty of noting its progressive alterations will properly devolve upon those who are professionally engaged in observing and treating diseases.

GENUS II.

EPIDEMIC METEORATION.

Epidemic meteoration comprehends all those insensible qualities of the general atmosphere, which produce, or favour the prevalence of popular diseases.† The term used to designate this genus may be considered as corresponding in the

* New-York Med. and Phys. Journal, No. VII.

† This source of disease may also be denominated *INSENSIBLE METEORATION*, a term we shall frequently employ as a synonyme of *Epidemic Meteoration*.

main with the *το θείον* of Hippocrates, the *seminarium e cælo demissum* of Diemerbroeck, the *general or primary contagion* of Webster, and the *epidemic and pestilential constitutions* of Sydenham and other medical writers. It must be observed, however, that several of these terms are not as restricted in their signification as that of *Epidemic meteoration*; for Hippocrates and Diemerbroeck appear to include in their respective terms both the morbid qualities of the atmosphere and its infectious impurities; and Sydenham and many writers of the present day frequently employ the phrase epidemic or pestilential constitution to denote any general ærial cause of disease, not distinguishing the morbid influences of the atmosphere from its miasmatal contaminations.

The word constitution, as it is commonly used in treating of the unhealthy qualities of the air, is very indefinite, and by no means suited to convey to the mind a distinct idea of the secret and noxious influences of the atmosphere;—many passages in the works of modern writers on epidemics have been rendered ambiguous by its employment.

In arranging the *Sensible* and *Insensible* qualities of the atmosphere under different heads, we form Genera, which are natural not only as respects their different modes of operating on the system, but as regards their effects. The former have at all times an influence on the constitution in the production of common diseases, whereas the latter display their energies periodically over a widely

extended field, inducing, or favouring the prevalence of epidemics.

It is remarkable, that the same varieties of *Epidemic meteoration* prevail in very different states of the atmosphere in respect to its sensible qualities. Sydenham remarks, "though I have carefully observed the different constitutions of different years, as to the manifest qualities of the air, that I might from thence discover the causes of the so great dissimilitude of epidemic diseases; yet I must own, I have hitherto made no progress; having found that years perfectly agreeing as to the manifest temperature of the air, have nevertheless produced very different tribes of diseases; and *vice versa*."* The same result terminated the patient and long continued researches of Van Sweitan. "I carefully remarked," says he, "for TEN successive years, three times a day, the height of the barometer, thermometer, the direction and strength of the winds, the quantity of rain that fell, the various changes of the air, diseases, number of the sick, and also all those who died. However, I do not repent my labour, though I did not thereby gain the *least knowledge of the original causes of epidemic diseases*."† Such observations have been often repeated in different parts of the world, and with no better success.

Insensible meteoration produces a variety of *epidemic*, or as they are sometimes called *pandemic*

* Works, Swan's Translation, p. 5.

† Commentaries, 1408 Aphorism.

diseases; and has the power of modifying, and promoting the prevalence of distempers arising from other causes. But the peculiarities and extent of its operations will be more fully considered in the second part of this work. At present, our object is to notice its nature and distinct effects.

Among the diseases produced by *Epidemic meteoration*, the most remarkable is *Influenza*, which frequently prevails over a vast extent of country. Sometimes it spreads from a point with great rapidity, and often appears in districts remote from each other at the same time. By some writers, it is considered as communicable from one person to another, and is accordingly denominated *Catarrhus Contagiosus*. This opinion is one of those delusions that formerly prevailed respecting certain febrile disorders which, affecting a great number of persons at the same time, were supposed to originate from specific contagions. The contagious fevers, such as small-pox and measles, affect the constitution but once; and were this the fact with regard to influenza, it would argue strongly in favour of its communicable nature; but “those who have had influenza once, twice, or thrice,” says Dr. A. W. Ives, “are not the less liable on that account to be attacked again. It is a very common occurrence for a person to have two attacks in one season. It is frequently the case that two-thirds of a family (more or less) will be taken at nearly the same time; and the remaining part of the family, living in the same rooms, and eating at the same table,

will escape it altogether.” “It is said by Mercatus, that in 1757 it attacked all parts of Spain at once, so that the greatest part of the people were seized with it almost in the same day. Dr. Glass says that when it prevailed in Exeter in 1729, it was conjectured that two thousand were attacked the same night.” Dr. Ives states that in 1815, “it prevailed at Quebec, Boston, and in New-York at the same time, while in most of the intervening towns it commenced two or three weeks later. This was not the only instance in which the disease seemed rather to *appear* than to spread over the country.”* The above facts, we think, conclusively prove that the Influenza is not propagated by contagion, but that it arises from a morbid condition of the general atmosphere.

The efficient cause of the Pneumonia Typhoides or Epidemic Peripneumony which prevailed in this country in the years 1812, 13, is referrible to the genus *Epidemic meteoration*. This disease extended over most of the northern and middle states, and its effects were sorely felt by the American army, in the late war on the northern frontiers.†

The Cholera Morbus of India is one of the most fatal diseases in the catalogue of epidemics. Whether it arises from infection or meteoration,

* See a Description of an Epidemic Influenza, &c. Transactions of the Physico-Medical Society of New-York, vol. i.

† See Transactions of the Physico-Medical Society of New-York, vol. i. New-York Med. Repository. American Medical and Philosophical Register.

or from their united agency, is undecided. The latest writers on the subject seem inclined to impute it to an occult quality of the general atmosphere.

The noted English sweating sickness which prevailed in 1483, 5, was imputed to contagion, produced by confinement in the ships which conveyed the Duke of Richmond and his army to England. But judging from the phenomena of the disease, which are noticed by the writers on epidemics, we think there can be no doubt that it was indigenous and originated from *Epidemic meteoration*. "Professor Gruner," says Dr. Adams, "has with immense industry collected all the writers on *Sudor Anglicus*, and calls it *Ephemera Catarrho epidemico persimilis*." "It is not less remarkable of this disease, that contrary to the true plague it affected the wealthy as well as the poorer class." "Lord Bacon informs us, that it began on the 21st of September, and had so entirely ceased before the end of October, as to be no impediment to the coronation which took place on the last day of that month. This is about the period of an influenza."*

The atmospheric origin of this disease is implied in the following lines of Armstrong.

" This rapid fury not like other pests
Pursued a gradual course, but in a day,
Rushed as a storm o'er half th' astonished Isle,
And strewed with sudden carcasses the land."†

* Inquiry into the Laws of Epidemics, p. 111, 112.

† Art of Preserving Health.

This disease prevailed in other countries of Europe, but chiefly among Englishmen residing or travelling in those countries; and what is remarkable, foreigners in England were not affected by it. These are interesting facts, as they show that the temperament of the inhabitants of one country renders them obnoxious to the morbid effects of a peculiar variety of *Epidemic meteoration* which has little or no effect upon a nation of a different temperament.

Besides those noticed above, various other disorders arise from *Epidemic meteoration*. Some of these appear in the form of angina, while others come under the denomination of fever. Such, however, always exhibit some peculiar symptoms which mark their epidemic character. Whenever in winter a disease, which is not contagious, is prevalent among the several classes of society, and is attended with unusual phenomena, it should be regarded as an epidemic arising from the secret influences of the common atmosphere.

Though *Epidemic meteoration* frequently exerts its energies on the human system, no research has been able to elucidate its nature and origin.

The older physicians supposed that epidemics were produced by vapours exhaled from the bowels of the earth; and among the arguments adduced to show that the atmosphere might be thus contaminated was the noxiousness of the gases emitted from certain springs and lakes, and of those found in mines, pits, wells, and the celebrated grotto del

cani.* The chemical constitution and properties of these gases are now generally well understood ; and as their effects on the system are different from every form of epidemic disease, no one pretends to identify them with the epidemic principles of the atmosphere.

As to the opinion of Carolus de la Font, Sydenham, and others, that epidemics are occasioned by *mineral exhalations*, as arsenical, mercurial, sulphurous, &c. raised by the heat of the sun, earthquakes, or subterraneous fires, it may be observed, that the disorders occasioned by mineral substances, so far as they are known, have no resemblance to those epidemics which arise from a general aërial cause ; nor is it true, that those countries suffer more by such epidemics, where the heat is greatest, and where earthquakes and volcanic eruptions are most frequent.

If wide-spread epidemics are caused by unwholesome vapours exhaled from the bowels of the earth, they would immediately succeed earthquakes and volcanic eruptions, and always appear in the first instance among the inhabitants of the surrounding districts, and from thence extend in the course of the winds. The history of atmospheric epidemics, however, warrants the assertion that they frequently begin and progress in a different manner. Sometimes they commence in sections of country where earthquakes and volcanic eruptions

* See an Essay on the Different Causes of Pestilential Diseases, by John Quincy, M.D.

have not recently occurred : sometimes they spread over extensive regions against the prevailing winds ; and occasionally appear at the same time in every part of a country, and on board of ships distant from land. These facts strongly militate against the doctrine in question ; and the attempt to explain them by supposing that poisonous vapours progressively or simultaneously rise from the depths of the earth, through tracts of land, and ocean, co-extensive with epidemics, and that too, without being accompanied by sensible phenomena, must be regarded as an entire dereliction of the rules of inductive reasoning.

If mineral vapours issue from the bowels of the earth, it is undoubtedly through excavations and fissures, produced by volcanic fires and convulsive disruptions of the outer crust of the globe ; and allowing that they possess the epidemic qualities ascribed to them, there is no probability that they would remain inoperative until they had spread far and wide through the atmosphere, and then suddenly exert their noxious powers alike in every place to which they had extended, or in remote parts earlier than in others, nearer to their points of emission from the earth :—on the contrary, it is evident that their effects would be felt by the population first exposed to their influence, and that their epidemic operations would progressively extend to other countries.

But that the vapours exhaled in consequence of earthquakes and volcanic eruptions, the gases

emitted from certain springs and lakes, the fuliginous emanations from vegetable and bituminous substances, undergoing combustion, the marine salt evaporated from the ocean, and various other matters volatilized by the agency of caloric and water, do in fact render the atmosphere more or less hurtful to the animal and vegetable creation, there can be no question. Some of these occasion disease by their acrid properties. Of this kind were the vapours discharged by a volcano in Iceland in 1783. "The water that fell in rain was acrid and corrosive, destroying cattle and men, covering the bodies of cattle with pustules and ulcers, and excoriating the hands and faces of men."* Others affect the salubrity of the atmosphere by their irrespirable qualities; but their effects on the system are never of the febrile character. In a word, the disorders induced by the several kinds of effluvia just enumerated, are observed only in the vicinity of their sources; and as before remarked, have no resemblance to those wide-spreading distempers which have frequently occurred in every age and in every quarter of the world. The only effect, therefore, which such impurities can be supposed to produce during an epidemic, is to modify its character; but such an effect, we apprehend, is never distinguishable.

From these observations, it appears that *Epidemic meteoration* cannot be ascribed to poisonous

* Webster.

gases diffused in the atmosphere; and consequently its origin must be sought for in certain changes which this fluid undergoes in its elementary constitution.

The principles which form and are *constantly* present in the atmosphere are usually divided into essential and adventitious; but, in investigating the causes of epidemics, we think they may be more properly divided into *ponderable* and *imponderable*. Of the ponderable kind are *oxygen*, *nitrogen*, *carbonic acid*, and *aqueous vapour*, the several proportions of which, excepting the latter, are found to be remarkably uniform at all times, and in all parts of the world. It is evident, therefore, that those principles of themselves can have no direct agency in producing epidemics. But as they are universally combined with the imponderable elements, *light*, *caloric*, and *electricity*, the proportions of which are *variable*, as is also the aqueous vapour, it follows that the qualities of the atmosphere may undergo a variety of changes; for it is an established truth in chemistry, that the same elementary substances, united in different proportions, form compounds different in their properties. The *imponderable* elements, which enter into the composition of the air we breathe, are no doubt as essential to the health of animals and plants as its *ponderable* constituents; and hence it is reasonable to conclude, that certain variations in the proportions of the former, will render the atmosphere highly insalutary and destructive to life.

Allowing these observations to be well founded, the inquiry may be made, which of the imponderable elements is the most concerned in originating *Epidemic meteoration*. We know of no facts which show that *light* has any agency in producing epidemics, and as these diseases cannot be attributed to the vicissitudes of *temperature*, it appears that *caloric* is not of itself adequate to the effect. It seems probable, therefore, that *Epidemic meteoration* arises principally from variations in the quantity of electricity.

If this view of the subject be correct, it is obvious, that many varieties of *Epidemic meteoration* may spring from certain quantities of electricity, concurring with certain proportions of the other variable constituents of the atmosphere; but in what manner these principles are combined with the other component parts of the air, or in what proportions they exist in the *varieties* of *Epidemic meteoration*, we shall not attempt to investigate: as yet, observation and experiment have made no progress towards elucidating this subject.

With regard to the supposed connexion of epidemics with earthquakes, volcanic eruptions, and the appearance of comets, we have only to observe, that if such a connexion does really exist, it may be more philosophically explained by means of the imponderable elements mentioned above, than by the doctrine of extraneous poisons diffused in the air;—indeed, if the heavenly bodies have an insalutary influence on our atmosphere, it must be

through the agency of electricity, or some other ethereal element. Some of the more striking phenomena of earthquakes and volcanic eruptions are electrical,* and though these phenomena may not be accompanied or followed by diseases in the districts where they occur, yet they may have a connexion with those states of the atmosphere which are productive of epidemics in different and very remote regions of the earth.

The two Genera of Meteoration severally present such a concourse of *varieties*, that further observation and research are necessary before we can proceed with confidence to divide them into *Species*. Several modes of arranging those varieties, however, might be suggested; but so long as any of them remain to be investigated, we shall not venture upon their classification. A knowledge of the *varieties* of *Epidemic meteoration* can only be acquired by studying the modifications and laws of popular diseases.

In the preceding pages, we have endeavoured to arrange the remote causes of febrile and epidemic distempers in an order as conformable to nature as the present state of etiological science will admit. The following synopsis will present the whole arrangement under one view.

* See Mitchell on the Earthquakes of 1811—12. Transactions of the Literary and Philosophical Society of New-York, Vol. I.

*A Synopsis of the Remote Causes of Disease, as investigated
and arranged in the preceding pages.*

ORDER I.

CONTAGION.

GENUS I.

CONTAGION COMMUNICABLE EXCLUSIVELY BY CONTACT.

Species.

Contagion of Itch.

Syphilis.

the Sibbens of Scotland.

the Laanda of Africa.

Frambæsia, or Yaws.

Elephantiasis, or Leprosy.

Hydrophobia.

Vaccina.

GENUS II.

**CONTAGION COMMUNICABLE BOTH BY CONTACT AND BY THE
ATMOSPHERE.**

Species.

Contagion of Small-pox.

Measles.

Chicken-pox.

Scarlet Fever.

Hooping-cough.

ORDER II.

INFECTION.

GENUS I.

KOINO MIASMA.

Species I.

**Protokoino miasma—producing intermittent and remittent
fevers.**

Species II.

Perkoino miasma—producing yellow fever and plague.

GENUS II.

IDIO MIASMA.

Species I.

Protidio miasma—producing the mild forms of typhus.

Species II.

Peridio miasma—producing the malignant forms of typhus.

GENUS III.

IDIO-KOINO MIASMA.

Species I.

Protidio-koino miasma—producing the mild forms of compound fevers.

Species II.

Peridio-koino miasma—producing the malignant forms of compound fevers.

ORDER III.

METEORATION.

GENUS I.

SENSIBLE METEORATION.

Producing croup, pleurisy, and other phlegmasial disorders.

Species—undefined.

GENUS II.

EPIDEMIC METEORATION.

Producing influenza, pneumonia typhoides, angina, and various other epidemic diseases.

Species—undefined.

PART II.



AN INQUIRY

INTO

THE PHILOSOPHY

OF

EPIDEMICS.

AN INQUIRY, &c.

SECTION I.

OF THE DIFFERENT KINDS OF EPIDEMICS.

It is remarked by the illustrious Sydenham, that “to reduce all the species of epidemics into *Classes*, according to the varieties of their appearances, to explain their peculiar signs, and point out the proper method of cure for each, is a very difficult task, and requires much time ; and as they arise in no stated order of years, (at least this is not yet discovered) to procure a just collection of observations about them, would perhaps require more than the life of any one physician ; yet this task, how difficult soever, must be performed before it can be justly said we have done any thing considerable towards discovering the intricacy of these disorders.”* The rule of logic, that facts must be accumulated before we attempt to generalize, is a salutary restraint against the vagaries of speculation. Sydenham, for the most part, strictly adhered to this rule, and consequently did not attempt to

* Works, Swan's Translation, p. 11.

reduce the species of epidemics into classes. He ascribes all general diseases to certain "latent and inexplicable alterations of the air." In treating of febrile complaints, universally acknowledged to be communicable, he never adverts to contagion, and rarely speaks of the miasmata arising from the corruption of animal and vegetable substances. His mind was constantly intent on the occult qualities of the atmosphere, as the only sources of epidemics; and hence he was unable to account for the various forms of popular diseases, or to explain the manner in which one distemper is modified by the remote cause of another.

Since his time, the causes of disease have been particularly and extensively investigated, though their essential nature is still concealed from the human understanding. It is now well established, that epidemics, instead of arising exclusively from the secret qualities of the atmosphere, sometimes originate from other causes; but notwithstanding our improved state of knowledge, no attempt has yet been made to arrange them into classes upon scientific principles:—still they have been variously divided by different authors.

Though Sydenham could discover no determinate data upon which to found a classification of epidemics, he observes, "that all epidemics are of two sorts, viz. *vernal* and *autumnal*, and though they may arise at a distant time of the year, yet they must be referred to spring or autumn, accord-

ingly as they may approach either respectively.”* This division, it will be perceived, is entirely arbitrary.

Mr. Webster also makes two kinds of epidemics ; “ first, those which are limited to a particular town, city, or country ; secondly, those which pervade whole quarters of the earth, or the whole globe. The first may be called *local*, the last *general* or *universal* epidemics.” This division is not only unscientific, but extremely indefinite, as is evinced by the author’s own observations subjoined to the above. He says “ angina is often a *general* epidemic, sometimes *local*. Pestilential fevers (which he considers usually local) in certain periods, become *general* over vast tracts of the earth. The same is observable of the measles.”†

Dr. Adams’s classification, so far as it goes, is founded on correct principles. In treating of the means of lessening the effects of epidemics arising from, or increased by the constitution of the atmosphere, he says, “ these epidemics are of *two kinds*. The first depends on constitutions of the atmosphere, occurring at uncertain periods, but always increased by locality or the state of society. The second arises from the soil, the exhalations from which are injurious at certain seasons ; but either these exhalations are more powerful at some of these seasons, or their effect is increased by a cer-

* Works, p. 6.

† History of Epidemics, vol. ii. p. 62.

tain constitution of the atmosphere.”* In this arrangement, Dr. Adams takes no notice of the contagious diseases which, in other pages of the same volume, he describes as occurring epidemically. In his work on morbid poisons, he specially remarks, that “infectious and *contagious* diseases may both be said to be epidemic at certain times ; that is, there are certain constitutions of the air more favourable to their extension than others ;” and yet, in this work, he confines the term *epidemic* to such diseases as originate in some unknown qualities of the atmosphere, in contradistinction to *endemic*. That contagious disorders prevail as epidemics in certain states of the air, can surely require no proof.

The works of Webster, Adams, and of some other writers, contain all the facts necessary for a correct classification of epidemics ; but it seems never to have occurred to them, that a natural arrangement of epidemics might lead to the disclosure of some of their higher and more intricate laws. To enable us to advance beyond the investigation of particulars, and to reason abstractly on the philosophy of epidemics, such an arrangement, with an appropriate nomenclature, is, we apprehend, indispensable.

In the first part of this work, we have endeavoured to exhibit the manner in which the sources of disease arrange themselves into natural

* Inquiry into the Laws of Epidemics, p. 34.

orders ; and these, we are now prepared to assert, furnish the proper and only scientific grounds for a natural division of epidemics.

In this opinion, we are confirmed by the reflection, that any attempt to assort them, in a natural method, according to their morbid phenomena, seasons of appearance, or extent of prevalence, would prove unsatisfactory ; and hence, if that method be the only one countenanced by inductive philosophy, their division must be founded on their etiology.

As the Orders, Contagion, Infection, and Meteoration, embrace all the efficient causes of popular diseases, arranged according to their natural affinities, they obviously direct us to the division of epidemics into three kinds, namely, *Contagious*, *Infectious*, and *Meteoratious*, which may be defined as follows :—

1. CONTAGIOUS EPIDEMICS consist of those diseases which are produced by the second Genus of the Order Contagion ; that is, such as are febrile and communicable through the medium of the atmosphere. They attack individuals but once during life, a circumstance that renders their prevalence in a community less general than the other kinds of epidemics. They occur in all seasons of the year, and at certain periods, take an extensive range in the earth.

2. INFECTIOUS EPIDEMICS prevail in the summer and autumn, in situations which give origin to *Koino miasma*. Some of them are principally con-

fined to cities, as plague and yellow fever, arising from *Perkoino miasma* ; while others not only occur in cities, but especially reign in marshy and flat countries, as intermittent, remittent, and dysenteric fevers, arising from *Protokoino miasma*.

3. METEORATIOUS EPIDEMICS are produced by those states of the atmosphere which we have denominated epidemic meteoration. They are, for the most part, peculiar to no season of the year ; nor do they observe any bounds, or limitations to certain kinds of soil. They prevail alike in low countries and mountainous regions. Occasionally, they are confined to districts distinguished for their general salubrity ; but more commonly, they extend over a wide tract of country, and not unfrequently, at the same time, affect mariners at sea, and the inhabitants of the remotest islands of the ocean. Influenza is a remarkable instance of this kind.

This division of epidemics is evidently founded in nature ; but it presents them in their distinct forms only. Their concurrence, or rather the prevalence of a disease of the first class with that of the second and third, and their consequent modifications, forms a deeply interesting and important subject of inquiry.

SECTION II.

OF THE MANNER IN WHICH EPIDEMICS MODIFY, AND SUPERSEDE EACH OTHER.

THE fact that a prevailing disease swallows up all other disorders, or compels them to wear its livery, has been stated by every writer on epidemics, from Hippocrates to the present time ; and yet, owing to the want of a proper classification of the causes of epidemics, it has never been explained in a clear and satisfactory manner.

The law by which epidemics modify and assimilate each other, is, no doubt, founded on immutable principles. So far as we have been enabled to pursue the investigation, all the facts, derived from practical writers, and which have occurred under our own observation, go to establish the following general aphorism.

Whenever any of the diseases belonging to the several classes of epidemics, prevail together in the same place, they become involved in each other in the order we have arranged them ; *e. g.* if a *contagious* disorder prevail during an *infectious* epidemic, the latter will modify the character of the former ; and in like manner, if a *meteorationous* epidemic occur with either or both of the prece-

ding diseases, it will assimilate them more or less to its own nature.

This law, it will readily be observed, results from the peculiar nature of the remote causes of the several classes of epidemics.

The diseases which belong to the first class are specific and contagious, and being incapable of poisoning the atmosphere generally, or of affecting persons a second time, cannot impart to the air the power of modifying other prevailing complaints. The diseases of the second class depend upon the diffusion of a miasmatic poison through a considerable tract of the atmosphere ; and consequently, all the disorders of the first class, which occur within the circle of its range, are compelled to wear the livery of an infectious fever. The diseases of the third class arise from causes which have a sovereign influence on the human constitution, and of course, when they prevail epidemically, all other disorders assume their character.

If a more explicit illustration of this law be required, let it be supposed, that small-pox and measles are prevalent in a city or country-town in which an *infectious* fever, for example, bilious remittent fever, is at the same time epidemic. The miasm, which produces the latter, will affect all who are exposed to its influence—every disease will more or less assume the character of the reigning epidemic ; and although small-pox and measles are essentially peculiar in their nature, they will nevertheless exhibit the modifying impressions of the

prevailing infection. Both diseases will exhibit some of the symptoms of a bilious remittent fever, and their treatment will demand a correspondent modification. And again, suppose that a *meteoracious* epidemic, for instance, influenza, appears during the prevalence of the diseases above mentioned. In this case, the small-pox and measles will be modified in a two-fold manner, first, by the infectious poison, and secondly, by the epidemic meteoration which produces the influenza; or, in other words, those disorders will discover the operation of three distinct remote causes, contagion, infection, and meteoration. In like manner, the bilious fever will betray the influence of the two latter. The predominating disease will obviously be the influenza.

We shall now adduce a few examples, first, to show that this law has not been well understood, even by physicians of great discernment; and secondly, to prove its general operation in the manner above stated.

1. The fame of Sydenham is identified with his histories of epidemics, though his views in some instances are manifestly incorrect. In describing the continued fever of the years 1667, 8, and 9, he remarks, "now as this fever depended upon that constitution of the air, which, at the same time, produced the small-pox, so in effect it seemed to be nearly of the same nature therewith, except in those symptoms which necessarily depended on the eruption. For they both attacked in the same manner,

and were attended with the like pain and soreness of the parts below the pit of the stomach, there was the same colour of the tongue, and consistence of the urine, &c. The same profuse sweat arose in the beginning, and the same tendency to a salivation when the inflammation was violent, as accompanied the small-pox when it proved of the confluent kind. Since, therefore, this fever did also prevail chiefly at the time the small-pox was more epidemic than I had ever known it here, no one can doubt of their being of the same tribe. This I certainly know, that all the practical indications were manifestly the same in both diseases, those excepted, which the eruption of the small-pox and the symptoms thence arising afforded, which could not be expected in this fever, because it was not attended with an eruption. And this indeed appeared very evident to me, from the accurate observations I made in such as had either of these diseases. For these reasons, I must be allowed to call this a *variolous fever*, not because I affect the giving new names to things, for no one can dislike that more than I do, but in order to distinguish it from other fevers, and on account of the great similitude which it bears to this sort of small-pox.”*

In this instance, Sydenham supposes that the *fever* was made to resemble the *small-pox* by that constitution of the air which induced the latter

* Works, Sect. iii. Chap. iii.

disease, whereas the reverse of this was undoubtedly the fact. Small-pox becomes *epidemic* in certain states of the atmosphere, by means of a specific contagion, communicated from one individual to another. When it exhibits the phenomena of a fever which is prevalent at the same time, there can be no hesitation in concluding, that they have arisen from the modifying influence of the remote cause of that fever ; for it assumes various forms which Sydenham has well described, always conforming, more or less, to the character of the prevailing infectious or meteorious disease.

Dr. Swan, the Annotator on the writings of Sydenham, in illustrating the passage just cited, has fallen into a similar inaccuracy ; and Dr. Rush has referred to it with a view to prove “that no two fevers of unequal force can exist long together in the same place.” Were it true, that variolous epidemics always presented the same character, and that, at their commencement, and during their continuance, all the contemporaneous diseases assumed a corresponding character, it would be evident that small-pox had the power of assimilating, in a degree, other diseases to its own nature. But this is not the fact. Small-pox varies in its appearance in different seasons, being always modified by the infectious or meteorious disease that may happen to prevail at the time ; whence it follows, that its varieties are owing to the general causes of the co-existing diseases.

otherwise tolerably healthy, had a very favourable kind.”*

The stagnating canals at Grand Cairo are said by Prosper Alpinus to breed every year a *malignant kind of small-pox*, and also putrid and *pestilential fevers*, by which we are to understand that the koino miasma exhaled from those canals and their margins, assimilate the small-pox, so far as its nature will admit, to the nature of the prevailing infectious fever.†

Dr. Rush has given us a well defined instance of a *contagious* disease, modified by the remote cause of an autumnal or *infectious* fever, in his account of the measles, as it occurred in Philadelphia in 1801. “The disease,” he says, “wore the livery of the autumnal fever in the following particulars. It was strongly marked by remissions and intermissions. The exacerbations came chiefly at night. There was, in many cases, a constant nausea and discharge of bile by puking. I saw one case, in which the disease appeared with a violent cholera morbus, and several in which it was accompanied with diarrhœa and dysentery.”‡

The same author has recorded a striking example of an *infectious* fever, which was modified and superseded by a *meteorationous* disease. In describing the *influenza* which appeared in the summer

* Essay on Fevers, p. 131, Edit. 3.

† See Pringle's Observations on the Diseases of the Army, p. 194, Edit. 1810.

‡ Medical Inquiries and Observations, vol. iv. p. 73.

of 1807, at the same time in nearly all the States in the Union, he observes, "the *bilious fever* which prevailed in August, imparted to it several of its symptoms. There were obvious remissions and intermissions, great pain in the back, and apparent cessation of the symptoms of the disease on the third, and a return of them on the fourth day, cholera morbus, dysentery, and an efflorescence upon the skin. The disease appeared in one respect to be a monster, *its head and breast wore the character of influenza, while its trunk and limbs indicated it to be a bilious fever.*"* The figure here used affords an admirable illustration of the supreme control of epidemic meteoration over infectious distempers.

From the foregoing citations, the reader will perceive, that though Huxham and Rush have recorded facts which happily illustrate the law which governs the modification and assimilation of epidemic diseases, they appear to have had no idea of the manner in which those facts were capable of being generalized. Had they investigated and systematized all the causes of febrile and epidemic diseases, and carefully examined their several and joint effects, they could not have avoided correct deductions.

In describing the operations of this law, we have said nothing of *idio miasma*. It may now be observed, that this miasm rarely or never prevails

* Medical Inquiries and Observations, vol. iv. p. 102.

epidemically ; yet like the other forms of infection, it has the power of modifying contagious diseases ; and it is doubtless to this cause, that Huxham refers some of the modifications of small-pox mentioned in a preceding page.

When *idio miasma* unites with the exhalations of the soil, it may, under extraordinary circumstances, exert an epidemic influence ; an example of which we have in the noted pestilence of Athens. In this instance, the *idio-koino miasma* gave a unity of character to all the prevailing diseases. Thucydides tells us, that “ none of the common maladies incident to human nature prevailed at that time, or whatever disorder any where appeared, it ended in this.”*

It is proper to remark, that the law we have endeavoured to explain, is not limited in its operations to *epidemic* diseases ; for the disorders which arise from sensible meteoration, internal causes, casualties, &c. generally show some of the phenomena of the reigning infectious or meteoratious disease.

The history of ancient epidemics is, in regard to many of them, so exceedingly deficient of particulars, that it is impossible to determine whether they originated from infection or meteoration. Were we in possession of all the facts connected with their rise and prevalence, it would not be difficult to distribute them in the several preceding

* Smith's Translation, p. 165.

classes, or at least, to show what was the predominating morbid influence. It is owing to this defect in many of the older records, that so little benefit results from attempting to elucidate the nature and laws of the epidemics of the present day, by referring to those of past ages. Even as late as the time of Sydenham, the *constitutions* of the atmosphere were supposed to be the only sources of popular diseases; and hence, the medical antiquary must forever remain in doubt with respect to the particular causes and nature of many former epidemics.

The agency of *infection* and *meteoration*, severally and conjointly, may be observed in most parts of the world; and if physicians would attend to the operations of both, carefully discriminating the effects of each, their histories of diseases would admit of such accurate comparisons, that posterity could not but derive from them a complete series of facts, illustrative of the laws and phenomena of epidemics.

SECTION III.

OF THE ORIGIN OF THE PYREXIOUS CONTAGIONS,
WITH FURTHER ILLUSTRATIONS OF THE MANNER
IN WHICH EPIDEMICS MODIFY EACH OTHER.

THERE is a doubt in the minds of many distinguished physicians, whether the small-pox, measles, scarlet fever, and the other febrile contagious diseases are invariably produced by morbid animal poisons. The essential and distinctive peculiarities of these disorders obviously seem to indicate, that they always arise from the same causes; yet their disappearance for a considerable space of time, and their recurrence as epidemics in places where it is impossible to trace them to contagions introduced from abroad, strongly argue, not only that their prevalence is favoured by certain states of the atmosphere, but that they sometimes occur spontaneously. This evidently appears to be the fact with measles, scarlet fever, chicken-pox, and hooping-cough. The opinion that these disorders originate from no other causes than specific contagion, is rendered improbable by many other considerations, which will occur to every one who duly reflects on the subject.

If it be supposed that contagious diseases become epidemic from individual cases which spring up in the midst of a population, *de novo*, we are compelled to regard those cases as arising either from *meteoration* or from *internal causes*; for it is obvious, that *infection* never produces any of the contagious exanthemata, or other disorders which affect the system but once.

We formerly stated that *infection* never imparts to *fever* a contagious attribute; and this statement was predicated on the fact, that infectious miasms are of chemical origin, and produce disease by virtue of their virulence, and that the system could not regenerate and multiply them by a secretory process. Now if the morbid effects of *meteoration* result from poisons, introduced into the human body, we may, on the same principle, allege, that none of its diseases can ever become contagious. But if *meteoration* operates on the system altogether extrinsically, producing certain peculiar impressions, which occasion febrile disease, the question naturally arises, whether the train of morbid actions thus excited may not in some circumstances of the constitution produce contagion?

Believing that the origin of the contagious disorders in question cannot be ascribed to infectious miasms, and as there is no reason to suspect that they originate from internal causes, independently of external influences, we are inclined to think, that *meteoration* may, and does, at certain times, affect the human system in such a way as to

cause it to generate contagious poisons. In the production of these, however, it is presumed, that considerable depends upon a peculiar condition and temperament of body, induced by mode of living, state of society, &c.

This explanation of the origin of contagious diseases is obviously more philosophical than the supposition, that their respective poisons were, in the first instance, produced by certain combinations of elements out of the body, and received into it with the ingesta, or through the medium of the atmosphere in respiration.

It frequently happens, that two or more of those maladies appear together in the same place, and apparently arise from the same state of the atmosphere ; a fact which renders it extremely improbable that they proceed from poisons formed exterior to the human system. We have no knowledge of any substances, engendered by a chemical process, uninfluenced by organic life, which possess precisely the same properties as those produced by either healthy or morbid secretions. And we cannot but view it as unreasonable, to suppose that several specific contagions may be at the same time generated in our food, or in the atmosphere, or any other situation external to the body, each producing the cases which form the commencement of contagious epidemics.

The influence of *meteoration* in originating contagions, may be exemplified by the phenomena which take place in the spontaneous production of

hydrophobia.* This distemper arises, probably, in every primary instance, from atmospheric causes, and acquires in its progress the property of contagion. It being a febrile disease, attempts have been made to draw an analogy between the origin of its peculiar virus, and the supposed contagious principles of *malignant fevers*. The following observations of Dr. Quincy on this point, are deemed worthy of notice. “But the case of a mad dog entirely comes up to that of a contagion from a *fever*. This animal, in the *hotter* seasons of the year, is subject to be thrown into a fever; which fever, for want of such free vent through the pores of the skin as in a man, critically discharges a great deal of morbid matter by the glands about the mouth, lungs, and parts leading thereunto: and it is very well known, that this matter is of such a poisonous nature, that where by a bite, or wound otherwise made, it is infused into the juices of other creatures, it will excite in them the same kind of distemper. But the dog, before this fever, had nothing of a poisonous nature in him, and therefore the venom generated by the fever must be from such an alteration made upon the animal juices, as changes them from a smooth, soft, and inoffensive, into a fiery, dry, stimulating nature. So that there is nothing more

* Though we introduce Hydrophobia here for the purpose of illustration, we must observe that the origin of those contagious diseases which are communicable only by *contact*, is a subject foreign to our inquiries.

happens in this case to the dog, than to a man in the highest degree of a *malignant fever*. The *same cause in both* generates a poison where there was none before, only one is more naturally vented by the glands about the mouth, and the other by the whole surface.”* In discussing this subject, Dr. Quincy has not discriminated between *infection* and *meteoration*. He very properly attributes rabies to a meteorationous cause ; and thus far places it on a footing with small-pox, measles, scarlet fever, and other contagious diseases ; but certainly not with common *malignant fevers*, for these diseases never arise from *meteoration*, but from *infection* ; and of course, his reasoning must be incorrect when he concludes that “the *same cause in both* generates a poison where there was none before.” It will not be questioned that there is a wide difference between the *modus operandi* of the strictly *atmospheric* and *miasmatic* causes of disease. The former appear to produce their effects by operating on the exterior of the body, whereby a train of diseased actions are excited, which, it is supposed, in some extraordinary circumstances of the constitution, are so modified as to generate specific contagions : the latter are believed to act on the system as poisons ; and as there are no substances of chemical origin which have the power of inducing any form of contagious disease, it is evident, that none of

* Essay on the Causes and Cure of Pestilential Diseases, p. 49, 50, Edit. 1721.

the species of infection are possessed of such a power. The reasoning of Dr. Quincy is certainly ingenious, and withal, highly plausible, until subjected to a rigid analysis. The more we inquire into the principles of medical philosophy, the more are we impressed with the importance of establishing elementary distinctions.

But it may be said, that if these views be correct, the contagious distempers under consideration should be regarded as *meteorations* diseases. This would undoubtedly be proper, if the great majority of cases originated from atmospheric causes. The probability is, however, that of some of them, not one case in fifty or a hundred, and of others, not one in a thousand, or perhaps ten times that number, arises from meteoration. We have, in fact, no data from which to estimate the relative frequency of their primitive appearance; but from general observation, we are inclined to think that small-pox most rarely occurs *de novo* during its epidemic prevalence, and next to this, measles, then scarlet fever, chicken-pox, and hooping-cough. But it may be objected, that if these complaints do originate from the morbid influences of the atmosphere, they afford examples of meteoration diseases which are subject to the modifying and controlling influence of epidemic infection, contrary to the law formerly mentioned. To this we reply, that the disorders just enumerated are specific, and capable of affecting the system but once. Their effects on the constitution are uniform and

peculiar, and always must be so, otherwise they could not produce that change in it by which it is rendered unsusceptible to subsequent attacks. They never taint the atmosphere generally; but having, wherever they operate, a primary, and not a secondary influence, they can never be said to modify other epidemic disorders.

There are, however, some facts, which, as they appear at first sight to form exceptions to the principles here contended for, demand particular attention.

During the prevalence of scarlatina anginosa, it is frequently observed, that the contemporaneous diseases exhibit some of its cuticular and anginose symptoms. Such appearances were particularly noticed by Dr. Rush in 1783, 4. In his account of the scarlatina anginosa, which prevailed in Philadelphia at that period, he observes, that “the intermittent fever which made its appearance in August, was not lost during the month of September. It continued to prevail, but with several peculiar symptoms. In many persons, it was accompanied by an eruption on the skin, and a swelling of the hands and feet. In some, it was attended by a sore throat and pains behind the ears. Indeed, such was the predominance of the scarlatina anginosa, that many hundred people complained of sore throats without any other symptom of indisposition. The slightest occasional or exciting cause, particularly cold, seldom

failed of producing the disease.”* From these facts it would seem that a *contagious* disease, as scarlatina confessedly is, swallows up other complaints ; but when they are examined in all their bearings, they will be found to corroborate the preceding statements. It will be admitted, that none of the contagious disorders prevail extensively, unless there be an epidemic state of the air. Now this state of the atmosphere is frequently no less productive of cutaneous affections than it is favourable to the propagation of contagious diseases ; and it is by not attending to this circumstance and discriminating between the truly specific diseases and those which are contemporaneous and resemble them, that an error has long existed on this subject. The truth is, when *meteoration* favours the prevalence of any of the exanthemata, it also frequently produces diseases which are specially characterized by cutaneous eruptions. For example, when small-pox is epidemic, the prevailing meteoration sometimes occasions disorders of the skin, which are not communicable, which are strictly *meteorations*, and which, like other diseases of this class, sometimes mingle themselves with the variolous eruptions, and modify other complaints. This observation will also apply to measles and scarlatina. An instance of small-pox modified in the manner just noticed, is mentioned by Webster on

* Medical Inquiries and Observations.

the authority of Fairfield. In this instance, the eruption resembled that of scarlet fever.*

The meteoration which favoured the spread of small-pox in New-York in 1815—16, was productive of diseases of the skin.† During the last winter, 1823—4, variola has raged in various parts of the United States, affording many interesting phenomena illustrative of the laws of contagious epidemics. In this city, the *varioid* disease, *genuine* small-pox, and chicken-pox, have extensively prevailed; as have also a great variety of anomalous eruptions, occurring frequently in persons affected with other acute diseases. In some patients, these eruptions have appeared in the form of simple rashes; in others they have assumed a papulous, and in others a vesicular character. In a few instances, they have been observed to appear and disappear several times in the course of the same disease; and every attempt to classify them according to the received systems of nosology has proved unsatisfactory.‡

* History of Epidemic Diseases, vol. ii. p. 53.

† New-York Med. Repository.

‡ The deeply interesting nature of the varioid disease renders it proper in this place to notice its more remarkable peculiarities. Though its cause and nature were not immediately evident on its first appearance in Europe and America, they have since been determined with undoubted accuracy. From the facts recorded of this disorder in various countries, and from those which have come under our personal observation in this city during the last winter, we have been led to the following conclusions. 1st. That the varioid disease is a modification of *small-pox*, and that it oc-

As respects measles, when they prevail epidemically, other eruptive complaints frequently accompany them. A striking example of this kind we

curs principally in persons who have been vaccinated. 2d. That its peculiar character arises from the operation of the vaccine influence on the system not having been sufficiently intense or active to secure the patient from the effects of the variolous poison ; and that the vaccine disease operates with various degrees of force on different individuals, affording greater protection to some than others, and thus allowing small-pox to occur in them more or less modified. 3d. That it is capable not only of reproducing itself in vaccinated persons, but also of inducing genuine small-pox in those who are unprotected by previous variola or vaccina. 4th. That in its first or febrile stage, it is not distinguishable from genuine small-pox ; but that its modified character becomes evident after the appearance of the eruption, which, instead of advancing to perfect suppuration, terminates in desquamation usually on the fifth, sixth, or seventh day, leaving hard or tuberculated elevations of the skin. 5th. That it occurs only in a small proportion of those who have been vaccinated, and that particular families are more liable to its attack than others. 6th. That it is rarely fatal, and therefore should not materially lessen our confidence in the prophylactic powers of cow-pox.

With regard to the prevalence of the varioloid disease, there can be no question, that it is favoured by those varieties of *epidemic meteoration* which favour the propagation of small-pox. Variolous *epidemics* occur at no other periods than when the occult qualities of the atmosphere strongly predispose the system to that disease ; and probably, it is only during such epidemics that persons are subject to secondary attacks of small-pox. When this predisposition prevails in a community, it is easy to conceive, that those, in whom the cow-pox has not completely destroyed the susceptibility to variola will be particularly liable to it, in its modified form.

It would be a subject of interesting inquiry, whether persons

have already cited from Sydenham.* When scarlatina is epidemic, other kinds of eruptions and sore throats are often rife at the same time. Huxham, in his Dissertation on the Ulcerous Sore Throat, which was evidently a malignant form of scarlatina anginosa, remarks, that “in *all sorts* of fever there was a surprising disposition to *eruptions of some kind or other*, to sweats, *soreness of throat*, and *apthæ* ;” and he adds, “the small-pox was more fatal in August, and sometimes attended with a very dangerous *ulceration in the throat*, and difficulty of swallowing.”

The facts here assembled fully warrant the inference, that the prevalence of contagious diseases is favoured by those conditions of the air which are productive of diseases of the skin and throat ; and that in many instances, these meteorations disorders bear a striking similitude to the contagious exanthemata, though they are essentially different from them, not having the attribute of *contagion*. Were they really communicable, they would not impart any of their phenomena to other prevailing diseases, much less would they modify small-pox in

who are vaccinated during the epidemic prevalence of small-pox are not more perfectly secure from future attacks of modified variola, than when vaccinated in seasons in which an *epidemic meteoration*, favourable to the propagation of small-pox, does not prevail ? There are many considerations which might be urged on the affirmative side of this question.

* See page 144.

the manner stated by Huxham; for with Hunter, we believe that the operation of two specific contagions on the system at the same time, is incompatible.*

The preceding facts and observations, we think, evidently tend to show that those contagious disorders, which affect the human system but once during life, proceed from meteoration. In this view of the subject, we are enabled to perceive the true

* “Diemerbroeck, indeed, mentions a solitary instance,” says Dr. Adams, “in which the two diseases (small-pox and measles) took place at the same time. His son remarks on the passage, that he never met with a similar instance more than twice in his own practice. Diemerbroeck’s account is somewhat confused. It should be remarked too, that measles was at that period not so distinctly marked as in later times, and that with the small-pox and other exanthemata, an *universal efflorescence*, which may be mistaken for measles, is not uncommon.” (See his *Work on Morbid Poisons*, p. 10.) Similar instances are described by Dr. Russel, which were doubtless cases of small-pox, attended with a meteorationous efflorescence. (*Ibid.* and also *Med. and Chirurg. Transactions*, vol. ii. p. 90.) To prove satisfactorily that small-pox and measles can exist together in the same subject, it is necessary to show, that the patient can actually communicate both diseases to other persons—small-pox to some, and measles to others, and that too, without their being exposed to any other source of contagion. If two pyrexious contagions can operate on the system at the same time, why may not three or more? It is as easy to believe this, as to credit the statements of Diemerbroeck and Russel. If any two febrile contagious poisons ever act together on the system, they are no doubt those of variola and vaccina; and that this may be the fact, seems probable from the circumstance, that they produce the same result, namely, an immunity from secondary attacks of both diseases.

character of that form of disease which is distinguished by the term *Rubeola sine catarrho*, a disorder which generally appears when measles are epidemic, and which is well known not to secure the system from an attack of genuine measles. This latter circumstance evinces that it is not produced or communicated by contagion. It must therefore be regarded as arising from that kind of *meteoration* which originates genuine measles, and which especially favours their propagation. But still, *Rubeola sine catarrho* may be allied to genuine measles. It appears to be a meteoratious disease, which, under the circumstance of greater predisposition of the body to measles, would fully assume the character of that specific and contagious disorder.

Upon the whole, it results, first, that contagious disorders never assimilate other diseases to their own nature, but frequently prevail with meteoratious distempers, which exhibit phenomena closely resembling them; secondly, that though these two classes of diseases are primitively allied to each other, there is a broad distinction between them, the one being communicable, and rarely or never affecting the system but once; the other being incommunicable, and leaving the system exposed to repeated attacks; and thirdly, that it is the latter class which impart their character to the co-existing diseases, modifying and aggravating even those which are contagious.

Thus, as we have said, *Rubeola sine catarrho* is a disease different from genuine measles. If it be

worthy of a name expressive of its cause and resemblance to rubeola, we would call it *meteorationous measles*.* This denomination would imply that it is neither contagious, nor capable of destroying the susceptibility of the system to subsequent attacks. Thus also the rashes and anginose affections, which are sometimes so universally observed during the prevalence of the true scarlatina anginosa, owe their origin to meteoration. They constitute a spurious, or more properly, a *meteorationous* form of scarlatina, which may repeatedly occur in the same person, and which, like the generality of meteorationous disorders, modify the character of other diseases.

If the foregoing observations be well founded, it is obvious, that in some instances, it may be difficult, if not impossible, to decide, whether patients are affected with genuine contagious eruptive fevers, as measles and scarlatina, so closely may their meteorationous counterfeits resemble them. The method to determine questions of this kind is to study the pathognomonic symptoms of those

* Annexed to the meteorological observations, made in Philadelphia in March, 1821, is the following notice. “Angina Tonsillaris, usually frequent in this and last month, also a slight eruptive fever, the eruption less diffused than scarlatina, and less distinctly circumscribed than measles—was commonly called the French measles. (*Eclectic Repertory*, vol. i. p. 471.) As this disorder originated from an atmospheric cause, a more proper term would have been *meteorationous measles*. Webster quotes similar forms of disease, and imputes them to a meteorationous source. (*History of Epidemics*, vol. ii. p. 53, 54.)

cases which are known to arise from contagion ; and thence to deduce criteria, by which the nature of doubtful cases may be settled. But in some instances, the difficulty can be removed only by ascertaining whether the system is susceptible or unsusceptible to future attacks ; and even this cannot in all cases be relied on, as it may happen that persons who have once had measles and scarlatina, may occasionally be affected by them a second time, as is now and then the case with small-pox.

In general, it may be said of the contagious exanthemata, that the difficulty of pronouncing upon their genuineness increases as we proceed from small-pox to measles, and from this to scarlet fever and chicken-pox. Now this, it will be observed, is the order in which we have supposed that they arrange themselves, as regards the relative frequency of their origin *de novo* ; and it is remarkable, that the liability of persons exposed to their contagions, to contract disease, appears to be diminished in a corresponding order.

SECTION IV.

OF THE DIFFERENT VARIETIES OF EPIDEMIC METEORATION, AND OF THEIR LAWS AND MODUS OPERANDI.

IN the preceding section, we have attempted to show that there are certain states of the atmosphere which have an influence in originating and promoting the prevalence of contagious diseases. We now propose to take a more extensive view of the varieties of epidemic meteoration ; and in doing this, we shall endeavour to exhibit all the more important facts relating to this interesting subject.

An unhealthy state of the atmosphere frequently continues for several consecutive years, varying in its qualities from time to time, in the same and different places. Sydenham frequently adverts to the occult morbid influences of the air, in treating of his *stationary* fevers ; and, indeed, every writer on epidemics, from Hippocrates to the present time, has given them particular attention. Dr. Rush observes, that “it is remarkable that a morbid constitution of the atmosphere sometimes exists under very different, and frequently opposite circumstances of its sensible qualities, and that the same con-

stitution of the air is often protracted for two, three, four, or even six years.”*

Though we are unable in our present state of knowledge to arrange the *varieties* of epidemic meteoration into definite *species*, yet in taking a general view of their *modus operandi*, we readily perceive that they may be advantageously divided into three kinds, viz.

1. Those which predispose the system to contagious diseases, and which favour their epidemic prevalence.

2. Those which favour the prevalence of infectious epidemics.

3. Those which of themselves are immediately productive of epidemics.

These three divisions comprehend all the varieties of epidemic meteoration which are concerned in the production, assimilation, and propagation of human diseases. Whether they are essentially different in their nature, cannot be determined in the present state of science. For aught we know, they are only modifications of one continued meteoration; and this, we apprehend, is the fact, seeing there is no time in which it can be said that acute diseases do not derive a part of their character from the secret influence of the air.

The history of *contagious* and *infectious* epidemics distinctly evinces that their rise, progress, and termination depend on peculiar states of the atmos-

* Medical Inquiries and Observations.

phere. The extensive prevalence of small-pox, measles, scarlet fever, dysentery, yellow fever, and plague, during certain periods, and their disappearance, under circumstances of weather, and seasons apparently similar, for a considerable space of time, are deemed conclusive proof that an *epidemic meteoration* must concur with *contagion* and *infection* in order to render them epidemically operative. As regards infection, the prevalence of yellow fever in the United States affords abundant evidence of this truth.

These considerations, however, by no means countenance that sweeping declaration which is sometimes made, that an unhealthy or pestilential state of the common atmosphere is the principal predisposing cause of yellow fever, plague, and remittent fevers ; for there is no fact in etiology better established than that these would never prevail epidemically, were it not for the agency of those species of *koino miasma* which we have already described.

The production of *koino miasma* is chiefly effected by the action of solar heat on animal and vegetable filth immersed in certain degrees of moisture ; and these circumstances alone are capable of producing it, in a limited quantity, independently of a favouring *epidemic meteoration*. Thus intermittent and remittent fevers are observed every autumn, in cities, and in low and marshy countries ; and cases of yellow fever yearly appear in some of the seaport towns of the United States and the West Indies. Indeed, there can be no question that

the primary and essential causes of these diseases are miasmal poisons, and that epidemic meteoration is of itself inadequate to their production. Plague and yellow fever *epidemics* appear in no other localities than those in which circumstances exist, suited to the generation of their respective poisons ; whereas the epidemic meteoration which favours their prevalence, so far from being limited to the spot where they occur, generally extends over a wide tract of country, in which they are unknown ; or, in other words, the same epidemic meteoration which favours the ravages of *perkoino miasma* in cities, is alike favourable to the prevalence of the fevers arising from *protokoino miasma* in all the surrounding swampy and campaign districts.*

The prevalence of plague and yellow fever, therefore, is believed to depend on the concurrence of *perkoino miasma* and *epidemic meteoration* ; the former being the agent which directly occasions disease, and the latter the power which promotes the generation of the miasm, and quickens the susceptibility of the system to its morbid impressions.

The agency of epidemic meteoration in the formation of *koino miasma*, appears to consist in the exertion of a peculiar influence on dead animal and vegetable substances, producing in them a *tendency*

* We are told by Dr. Irvine, of Charleston, S. C. that a season generally sickly is especially necessary to the appearance of yellow fever ; and this observation is corroborated by the most respectable American physicians.

to rapid decomposition, whereby heat and moisture are enabled to convert them more readily into miasmatic poisons, than in seasons of the same character, as to the sensible qualities of the air, but in which a different kind of insensible meteoration prevails. Pringle, in speaking of the autumnal epidemics of marshy countries, observes, that “at such times, all meats are quickly tainted.” “Diemerbroeck speaks of the putrefaction of flesh and all other things being quicker and ranker than usual (during the plague) at Nimeguen, in 1636.” “Forestus says it is one of the undoubted signs of an epidemic constitution, when all kinds of bread, fruit, flesh, &c. exposed to the air, become rapidly putrid.”* Dr. Mead remarks, “we learn from the observation of the Arabian physicians, that some indisposition of the air is necessary in the hottest climates, either to cause so exalted a corruption of dead animal substances, or at least to force upon men’s bodies the action of the effluvia exhaled from those substances while they putrefy.”†

There are facts which render it probable that the epidemic meteoration which predisposes dead animal and vegetable substances to rapid decomposition is of an electrical nature. It has long been observed, that storms, attended with thunder and lightning, are comparatively infrequent, during the prevalence of yellow fever and plague; and it is remarkable, that thunder showers, occurring when

* Hancock on the Laws of Pestilence.

† Medical Works, p. 248, London, 1762.

yellow fever is epidemic, frequently produce in those labouring under the disease, the most alarming, and even fatal consequences. These phenomena, not to mention others, evidently lead to the conclusion, that a peculiar electrical state of the atmosphere prevails in seasons of pestilence.*

The approach of a pestilential epidemic may frequently be foreseen by attending to the character of the diseases which appear in the vernal months, and the early part of summer; that is, before infectious effluvia are generated in any considerable quantity, or in their highest degree of virulence. Should those disorders exhibit anomalous appearances, and a decidedly malignant tendency, we may conclude, that an epidemic meteoration prevails, and have reason to apprehend the occurrence of pestilence.

The annals of popular diseases furnish many examples, which prove that the distempers, which precede plague and yellow fever epidemics, bear the meteorations and malignant impress by which these latter are distinguished. This fact was specially remarked by Sydenham and Hodges, of the

* The word *Pestilence* is used by most writers on epidemics in a very loose and indeterminate manner. Sometimes it is employed to express all the violent forms of epidemic diseases, though more commonly to designate those which rage in cities, as plague and yellow fever. As precision in the terms of science is extremely important, we employ it exclusively to signify those febrile diseases which originate from *Perkoino miasma* and the other malignant Species of Infection.

disorders which preceded the plague of London in 1665. Similar instances are recorded by Bellinus,* Van Sweitan,† Bayley,‡ and indeed, by most writers on pestilential epidemics. Dr. Mead sums up these facts in the general observation, “that fevers of extraordinary malignity are the usual forerunners of plague, and the natural consequence of that ill state of air which attends all plagues.”§

It may here be inquired, what are the diseases which exhibit so much violence, and which are the precursors of pestilence? They are evidently not those produced by *perkoino miasma*, for this poison is the immediate cause of the pestilence. They must, therefore, be such as arise from *contagion*, *protokoino miasma*, *idio miasma*, *sensible meteoration*, and other common causes of febrile disease, aggravated and rendered malignant by the prevailing epidemic meteoration.

If this view of the subject be just, we can readily account for the greater fatality of pestilential epidemics at their commencement than in their progress and decline.|| The system being highly pre-

* Webster on Pestilence, vol. ii. p. 44.

† Commentaries on Boerhaave's Aphorisms.

‡ Account of the Epidemic Fever of New-York in 1795.

§ Discourse on the Plague, Part i. Chap. i.

|| “All epidemics,” says Sydenham, “at their first appearance, as far as can be judged from their symptoms, seem to be of a more spiritous and subtile nature than when they become older; and that the more they decline, the more gross and humoral they grow.”

disposed to disease by the existing epidemic meteoration, is rendered extremely susceptible of the impressions of infectious poisons; and consequently, whenever *perkoino miasma* appears, its deadly effects are experienced by a large majority of those on whom it seizes. As the season advances, those who continue to reside in the pestilential air, become accustomed to its influence, and breathe it with less danger of fatal consequences. The system also gradually accommodates itself to the prevailing epidemic meteoration.

But there is another view of this subject. The diseases of the spring and early part of summer, instead of being anomalous and malignant, may be few and mild, and yet the following autumn may prove a season of pestilence, as was the case at Philadelphia in 1793,* and at New-Orleans in 1820.† From this it would seem that no *epidemic meteoration*, favourable to the prevalence of a pestilential fever, existed prior to its appearance. In all such instances, we apprehend, that the *epidemic meteoration* rises later in the season than usual; or supposing it to have prevailed for some time before the pestilence appeared, that there have not occurred those vicissitudes and intemperature of *sensible meteoration*, and other remote causes of fever, which are commonly operative in the spring and beginning of summer; for we view it as a sound proposition,

* Medical Inquiries and Observations.

† Report of the Committee of the Physico-Medical Society of New-Orleans, 1820.

that an epidemic meteoration may exist, and yet the season remain healthy, owing to the general absence of the more direct and efficient causes of disease. The observation of Dr. Russel, on this point, is believed to be substantially correct. He says, that "the approach of the pestilential constitution (epidemic meteoration) is slow, silent, and imperceptible; no human barrier can be opposed to it; but if it do not meet with latent seeds of contagion to animate or invigorate, (or, as we would express it, if *koino miasma* be not engendered under its favouring influence) it will pass on, perhaps, harmlessly to other regions."*

The decline and cessation of pestilence are attributable to the inhabitants becoming accustomed to the impressions of *perkoino miasma*, and to the poison being diminished in quantity, and finally destroyed by heavy rains, inundations, aridity of the soil, or a considerable reduction of the atmospheric temperature. These causes, however, though they effectually check the ravages of plague and yellow fever, appear to have no effect upon the epidemic meteoration which favours their prevalence, for the morbid state of the atmosphere frequently continues for some time afterward, and reproduces, in common diseases, the same anomalous and malignant symptoms which distinguished the disorders that forerun the pestilence. Such

* Treatise on the Plague.

phenomena were observed in the diseases which followed the great plague of London.

But it sometimes happens that pestilential epidemics disappear without the causes above mentioned having any agency in their suppression. To explain this fact, it is necessary to suppose, that the *epidemic meteoration* undergoes a change, which is incompatible with the further generation and prevalence of *perkoino miasma*—a change which, in effect, is equivalent to the reduction of the atmospheric temperature to 32° of Fahrenheit. In this manner, the plague is, no doubt, sometimes arrested in countries where frost never occurs. Chenot remarks, that “an evident sign of the plague being about to cease, is the appearance of common epidemic diseases, which manifest the *rise of another epidemic constitution*”—“Alpinus says, that when the plague ceases in Egypt, epidemic diseases begin to show themselves, which never appeared during the plague.”* There is reason to believe, if cities were *constantly* in a fit state for the prevalence of yellow fever and plague, so far as heat, moisture, and filth are concerned, that these diseases would appear only when an epidemic meteoration occurs favourable to the production of *perkoino miasma*, and that they would disappear as soon as the epidemic meteoration undergoes a change.

We have hitherto chiefly confined our remarks to those occult influences of the atmosphere which

* Hancock on Pestilence, p. 181.

promote the generation of miasmatal poisons, and which are otherwise concerned in the prevalence of *infectious epidemics*. We now proceed to observe, that one of the most remarkable attributes of epidemic meteoration, is its power of assimilating all the cases of a prevailing disease, so far as the different temperaments of individuals will admit, to a uniformity of character.

It is well known, that *contagious, infectious*, and other epidemic diseases, vary in their *diathesis* in different seasons. In some years, they are highly sthenic, and in others asthenic; and in addition to this diversity of character, they frequently spend their force on particular organs, sometimes on the head, and at other times on the stomach, lungs, or bowels. These pathological varieties arise, for the most part, if not entirely, from the insensible qualities of the air.

The effect of epidemic meteoration is to render the morbid diatheses of individuals alike throughout a whole community; and this effect, notwithstanding its occasional malignity, is in one respect, a beneficent provision of nature:—without it, the contagious and infectious epidemics of particular years would present no determinate character, and the physician, unable to acquire from observation, at the commencement of an epidemic, a knowledge of the force and tendency of subsequent cases, would frequently be embarrassed in the application of remedies, and undecided as to what extent they might be employed with safety and advantage; but

knowing the controlling and assimilating influence of *epidemic meteoration*, as soon as the *diathesis* and other peculiarities of an epidemic is ascertained, he proceeds boldly in a general plan of treatment. One caution, however, he will strictly observe:—the epidemic meteoration may undergo a change, and thereby vary the character of the disease; a circumstance which will demand a corresponding alteration in the method of cure. The works of Sydenham furnish many examples of this kind.

These observations naturally lead to the inquiry, whether the same kind of epidemic meteoration is contemporaneous in different countries in which the same disease is prevalent?

In discussing this question, it is proper first to inquire, how far the nature of epidemic diseases is varied by the influences of *climate*. Hippocrates has left us many valuable observations on this subject, in his writings on Air, Water, and Situation, and has drawn, with a masterly hand, the physical and moral peculiarities of those who inhabit different countries.

The various modifications in the constitution of the solids and fluids, which obtain in the different climates between the equator and the polar circles, necessarily diversify the force and appearance of diseases. These modifications form the basis of national temperaments, and principally depend on various degrees of temperature and moisture, the condition and occupations of men, the situation and face of countries, particularly as regards their geo-

logical structure, state of cultivation, and distance from, or proximity to, large bodies of water.

When all these circumstances are brought into one view, we might almost be persuaded, that they are capable of producing all the modifications of disease which are seen in the same and different countries. That much must be attributed to those causes cannot be questioned, especially as certain disorders are extensively prevalent in some countries, which rarely or never appear in others. But if we advert to *epidemic diseases*, we shall find that those causes do not explain their origin, or account for all their varieties of character ; for the truth stated by Sydenham, that years perfectly agreeing as to the manifest temperature of the air, produce very different tribes of diseases, is applicable to every climate ; and hence, to explain this fact, we must bring in the agency of epidemic meteoration.

Admitting, then, that climate has a considerable influence in producing and modifying diseases, the question recurs, whether the same kind of *epidemic meteoration* exists in different countries in which the same disease is prevalent ? A few general observations on the several classes of epidemics, will serve to elucidate this subject.

1. The most remarkable varieties of insensible meteoration are those which immediately produce epidemics. Now as these varieties are the efficient causes of disease, it follows of course, that they are always alike in every country, where the same *meteorations epidemics* appear, and that the modifications of

these several diseases must arise from the influence of local causes. For example, influenza, which is the best instance of a meteoration epidemic, sometimes pervades a vast extent of country. In all places, it exhibits the same general character, whence it is evident, that its cause is the same in every situation, and that its modifications in different districts are produced by the diversities of locality and climate.

The epidemic meteoration which produced the Pneumonia Typhoides, in the northern parts of the United States in 1812—13, probably did not essentially differ in its qualities in any of the districts in which the disease prevailed, notwithstanding in some places it manifested a more asthenic and malignant character than in others. The opinion of Dr. Hosack, in relation to this complaint, is undoubtedly correct. Presuming its *epidemic cause* to be the same in every situation, he says, “typhoid pneumonia is materially *modified by locality*, as is evident from the best accounts, furnished by the most respectable American practitioners, who have recently witnessed its ravages in various parts of the United States.”* Similar facts are recorded by Huxham. “I have once and again taken notice,” says he, “that an *epidemic disorder*, which in low, warm places near the sea, proved only a catarrhal fever, and scarce required any manner of bleeding, hath, in the neighbouring cold and high

* Practical Nosology, p. 205, note, Edit. 2d.

exposures, been attended with severe pleuro-peripneumonic symptoms, and demanded no small evacuation of blood." That Huxham considered the epidemic meteoration, from which the disease originated, to be the same in every place where it prevailed, is evident from his observations which follow the passage just cited.*

But although every atmospheric epidemic, which is characterized by the same pathognomonic symptoms, manifestly depends upon an identity of cause, yet it is probable, that the same kind of epidemic meteoration may act on the system with greater intensity in some situations than in others. Thus on the borders of its range, where it runs into another variety of insensible meteoration, its effects may be slightly felt; moreover, its force of action may vary, in degree, at the same time in different places, according as its epidemic operations may be commencing, progressing, or terminating therein; for it is frequently observed, that meteorary diseases gradually extend from one country to another, without differing in their nature, though often diminished or increased in violence.

2. If we now turn to those varieties of epidemic meteoration, which, instead of producing diseases peculiar to themselves, are principally operative in favouring the prevalence of *contagious* distempers, we shall meet with a different view of the subject.

* See his Essay on Fevers. p. 258. Edit. 3d.

The contagions of small-pox, measles, and other communicable febrile disorders, are severally of the same nature in all countries; and consequently, their diseases would always present the same appearances, were the constitutions of individuals alike, and the modifying influences of infection and meteoration always the same. But this is far otherwise. Contagious epidemics are not only modified by infection, but are varied in character by climate, and especially by *epidemic meteoration*.

If, then, it be supposed, that small-pox or measles is epidemic in places distant from each other, for instance, in New-York and London, the inquiry arises whether the *epidemic meteoration* which favours its prevalence, is of the same kind in both places? or whether different forms of it exist in those remote regions? In order to answer this inquiry, it is necessary to advert to the modifications of contagious epidemics which appear in the same city. In some years, they are observed to be much more inflammatory and malignant than in others; or, to use the terms of Sydenham, as applied to small-pox, they are sometimes *mild* and *regular*, and at other times *irregular* and *anomalous*. In some various epidemics, one-third of those affected in the natural way die of the disease, while in others, the mortality is scarcely one in fifty. As these discrepancies cannot be entirely ascribed to the varying influences of climate, or to the sensible qualities of the air, it is evident, that several and very different varieties of epidemic meteoration predispose the

system to contagious distempers, and favour their propagation.

The application of these facts to the question of small-pox or measles, in New-York and London, will enable us to solve it with accuracy. If the disease be *mild* in the former city, and *malignant* in the latter, or *vice versa*, (the influence of infection aside) the conclusion follows, that the *epidemic meteoration* is different in the two places,—but, should the phenomena of the disease correspond in both cities, that it is the same. Such variations, in the character of contagious epidemics, do undoubtedly often occur in various and distant countries.

3. Phenomena analagous to those noticed above are frequently observed in *infectious epidemics*. The character of yellow fever and other *koino miasmal* diseases, is, independently of the effects of locality and climate, remarkably influenced by the varieties of *epidemic meteoration*, in the same and different seasons and places.

First, with regard to the same place in different seasons. The yellow fever of Philadelphia, in 1793, admitted of copious depletion; whereas in 1803, moderate bleeding was sufficient to subdue the disorder. Dr. Rush tells us, that “the disease assumed a *new character* this year, and was cured by a different force of medicine from that which was employed in some of the years in which it had prevailed in Philadelphia.”—“The difference in the violence and mortality of the fever,” he thinks, “was probably occasioned by a less con-

centrated state of the miasmata which produced it, or by the *co-operation of a less inflammatory constitution of the atmosphere.*”* To the latter of these causes, we are inclined to ascribe the comparatively mild character of the disease; for we know of no facts which prove that the action of perkoino miasma, when it prevails epidemically, is ever materially lessened in force on account of “being in a less concentrated state.”

Secondly, with respect to different places in the same season. The documents relating to the yellow fever, as it appeared in New-York and New-Orleans in the year 1819, clearly evince, that the *epidemic meteoration* which prevailed in the two cities, was strikingly dissimilar. We are told, that in the disease at New-York, “the alarming debility and the exhausted state of the vital powers, forbade the employment of the lancet;”† while at New-Orleans, it is said that “venesection, when resorted to early, promptly, and fully, was most beneficial, and obtained at least a temporary mitigation of the symptoms, relieving for the time, the excruciating pains, and restoring disordered intellect;” and further, that “all the cases that terminated favourably were bled freely.”‡ The same kind of insensible meteoration appears to have prevailed in New-Orleans during the epidemic of the following year,

* Medical Inquiries and Observations.

† New-York Med. Repository, N. S. vol. vi. p. 125.

‡ New-York Med. Repository, N. S. vol. vi. p. 11, 12.

for it is stated that "bloodletting was generally indicated in the first stage of the disease, and in most cases, was carried to a very great extent with the happiest effects."*

The proximity of New-Orleans to the torrid zone, and the northern situation of New-York, forbid the supposition, that the opposite diatheses of the yellow fever in those cities in 1819 were entirely owing to a difference of climate. If this cause were capable of producing such effects, should we not suppose that the fever would have been more inflammatory or sthenic in the latter city than in the former. That this would have been the case seems evident from the fact, that cold climates produce a denser fibre, and a condition of body which admits of larger detractions of blood than that state of the system which commonly prevails in hot climates. But in some years it happens, that yellow fever exhibits the same meteorations modification, both in southern and northern countries, and again, in other years, it is marked by high sthenic action in the latter, and adynamic symptoms in the former.

In like manner, the character of plague, remittent and intermittent fevers, and even typhus, is often diversified by different kinds of *epidemic meteoration*. Sometimes, these maladies call for free depletion in their early stages; whereas, at other

* Report of the Committee of the Physico-Medical Society of New-Orleans, on the Epidemic of 1820.

times, they do not admit of the use of the lancet. Besides, there is frequently a remarkable tendency in autumnal fevers, to concentrate their force on particular organs. Thus, in one epidemic, the onus of disease falls on the head, and in another, on the stomach or bowels. Dysentery affords a striking example of a modified febrile disorder; it is usually, as we have said before, a miasmatic fever, which is changed to the dysenteric form by a peculiar variety of epidemic meteoration.

We have been the more anxious to draw a line of distinction between the influences of climate, and of epidemic meteoration, on account of its practical importance. It has been shown that climate varies the character of diseases, but that it is incapable of producing all the modifications of contagious and infectious epidemics; and hence we perceive the necessity of studying the diseases of particular countries, and of particular seasons. The physician, who is conversant with one climate only, is incompetent to discharge his professional duties with correctness in another. It is on this ground, that American physicians insist that the medical writers of Europe are not able to enlighten them on the nature and character of the epidemic diseases of the United States. But another reason, why the physicians of one country should not be governed by the precepts of those who describe the epidemics of another, is, the insensible meteoration, prevailing in districts remote from each other during the same epidemic, may be

different, and consequently, the practice must vary accordingly. That much light, however, can be shed on the nature and laws of epidemics by investigating the phenomena they exhibit in different parts of the world, cannot be questioned; but to treat them successfully, the remedies must be adapted to the climate and the variety of epidemic meteoration under which they appear.

Before closing our observations on the *varieties* of epidemic meteoration, it is proper to remark, that such of them as promote the spread of *contagious* diseases are generally unfavourable to the prevalence of *infectious* fevers, and *vice versa*. It is said by Sydenham, that “as many of these diseases (epidemics) appear in the same year, some one or other of them rules over the rest, which rage less at the same time; so that this one increasing, the others decrease, and this diminishing, the others soon re-appear.” This proposition is intended to express a general law of epidemics; but as it is here stated, it is neither sufficiently explicit, nor properly qualified.

As every epidemic depends either directly or indirectly on insensible meteoration, and as no two varieties of it can exist together, it is obvious, that two epidemics of equal power cannot prevail at the same time and place. But still, among the great number of varieties of insensible meteoration, there are, no doubt, some which are more or less favourable to the prevalence of several kinds of epi-

demio diseases. Thus, some of those varieties may not only immediately produce disease, but favour the ravages of contagious or infectious disorders, and especially of the former; indeed, the primitive affinities which have been shown to exist between *meteorations* and *contagious* epidemics, as well as the history of these diseases, seem to prove that certain states of the atmosphere are sometimes particularly favourable to their simultaneous prevalence.

But, though further observation and research are necessary to a complete exposition of this subject, in general, it may be said, that when a well defined *meteorations* epidemic is raging, for example, influenza, *contagious* and *infectious* disorders rarely or never prevail to any considerable extent. So also, when the atmosphere favours the prevalence of an *infectious* fever, no other disease ordinarily appears as an *epidemic*, yet such as do occur will be more or less assimilated to the character of the reigning malady. Thus far the observation of Sydenham may be regarded as strictly correct, that "as many disorders appear in the same year, some one or other of them rules over the rest." But the slightest reflection will render it evident, that this law is not applicable to contagious epidemics; for in no instance can they be said to *rule* over other complaints. They hold a subordinate station in the catalogue of general diseases; and though their propagation is favoured by insensible *meteoration*, yet as they cannot contaminate the air generally,

they can have no assimilating control over other disorders. It sometimes happens, indeed, that there are more cases of a contagious disease in a city or country-town than of any other malady ; and hence it was that Sydenham thought that small-pox and measles sometimes ruled over the disorders which “rage less at the same time.” As we have already shown the fallacy of this doctrine, we have now only to remark, that the insensible meteoration, which favours the prevalence of contagious epidemics, is operative on all the diseases which appear at the time, and to the character of these, however small be the number of cases, the prevailing contagious disorders will be more or less assimilated. Thus, according to Sydenham himself, “when the small-pox prevails, the fever of that year, which is *less general*, plainly partakes of the same inflammatory nature therewith.”

If any circumstance more than another distinguish the truly Hippocratic physician, it is the diligence with which he studies the operations of epidemic meteoration on the prevailing diseases. He who disregards or overlooks this plastic energy of the atmosphere, and directs his attention solely to the vicissitudes of the weather, and the changes of the seasons, can have but a partial view of the agencies concerned in the production of diseases ; and must frequently be in danger of committing errors in practice. Mr. Webster judiciously remarks, in speaking of Sydenham, that “his *occult* qualities have been ridiculed by later physicians,

and so far as his theory, *in this respect*, has been neglected, the science of medicine has degenerated." And he pertinently adds, that "if I mistake not, it can be made evident, that one of the most important, as well as most difficult branches of medical science, is to ascertain the effect of the reigning constitution of air on the prevailing diseases, and to apply that knowledge to the cure of those diseases."

* History of Epidemic Diseases, vol. i. p. 15.

SECTION V.

INQUIRY WHETHER EPIDEMICS OCCUR IN A DETERMINATE ORDER.

“Whether a careful examination, such perhaps as could not be made in the life of one man,” says Sydenham, “might show that certain tribes of epidemic disorders constantly follow others in one determinate series, or circle, as it were ; or whether they return indiscriminately, and without any order, according to the secret disposition of the air, and the inexplicable succession of seasons, I am not certain.” And again, he remarks, “the thing I endeavour is to show, by the assistance of a few years’ observations, how this matter stood lately with respect to my own country, and the city wherein I live; in order to assist in beginning a work that, in my judgment, will greatly tend to the advantage of mankind, when at length it shall be finished by posterity, and the whole series of epidemics be exhibited to view, as they shall succeed each other for the future.”*

The superior discernment and unwearied zeal

* Works, page 4, 12.

of Sydenham, in his medical pursuits, enabled him to accomplish more towards elucidating the laws and phenomena of epidemics than any who had preceded him. His pages, however, afford the clearest evidence that he frequently erred in his etiology of diseases. Believing that epidemics were generally produced by *constitutions* of the atmosphere, he naturally indulged the idea that those constitutions might revolve in a circle, giving rise to a determinate series of epidemics.

This idea would still be worthy of regard, were we to look to no other causes of epidemics than *meteoration*. But modern researches, and a sounder philosophy, have extended the boundaries of etiology. It is now generally admitted, that a majority of epidemics do not owe their origin immediately to the "constitutions" of the air; but to other sources, namely, *contagion*, the offspring of morbid animal secretion, and *infection*, the production of animal and vegetable putrefaction. Had Sydenham possessed clear and distinct notions of these causes of disease, and bestowed that attention to them which he gave to epidemic meteoration, he doubtless would have more largely contributed to the advancement of this department of science. He would have seen that the prevalence of contagious and infectious diseases is in a measure contingent; and consequently, that they could not enter with uniformity into a determinate series of epidemics.

Our distinguished countryman, Mr. Webster, has been at much pains to ascertain the order and progression of epidemic diseases. He has endeavoured to show that there is a natural connexion between the occurrence of earthquakes, the appearance of comets, and the ravages of pestilence. He says, that "every epidemic constitution seems to commence with measles or influenza. To these succeed angina, in some of its various forms, which are all the offspring of the same parent. Then follow pestilential fevers, in the form of dysentery, yellow fever, and plague."*

This industrious writer has assembled a multitude of examples to prove the above order and progression of epidemics. But the reader will perceive, at a glance, that he has arranged diseases together, which have no specific affinities, as measles, which is propagated by *contagion*, influenza, and angina, which originate from *meteoration*, and dysentery, yellow fever and plague, which depend on *infection*. If the history and causes of these disorders be carefully investigated, it will appear that their occurrence in the order he has enumerated them, will by no means certainly happen; but, on the contrary, may frequently be very different. It is true, the changes of the seasons introduce new diseases, and in this way only can certain disorders be said to succeed each other with

* History of Epidemic and Pestilential Diseases, vol. ii. p. 35.

regularity. But this is not the order he contends for ; he distinctly alludes to “ epidemic constitutions,” and we cannot wonder that he should have fallen into error, when we consider the data from which he has deduced his conclusion. He has travelled over a large portion of the earth, in order to gather facts suited to his purpose ; and having brought them together, finds no difficulty in reducing epidemics into a determinate series. In one year, for instance, he finds influenza or measles prevalent in different countries ; in the next year, angina in a particular town ; in the next, dysentery, plague, and yellow fever, in various and distant regions, and so from year to year, different diseases in different places, thus making out his succession of epidemics from the four quarters of the globe. This mode of reasoning is palpably illogical, and it is singular that the author did not see its fallacy. If such reasoning be admissible, it would not be difficult to establish any order of epidemics, which the imagination might suggest. We would not be considered as intending to disparage, or undervalue the medical writings of Mr. Webster. His endeavours to elucidate the causes and philosophy of epidemics have unquestionably tended to advance our knowledge of this intricate branch of science, notwithstanding, in some of his reasonings, he has not adhered to the rules of medical logic.

If we turn to the medical annals of different countries, we shall scarcely find any two of them

agreeing as to the succession of epidemics:—on the contrary, it will appear, that the popular diseases of one country rarely correspond with those of another. Take for example, Great Britain and Egypt, Buenos Ayres and New-York, or take places less remote from each other, compare the order of the epidemics which have prevailed in each for any number of years, and the result will afford incontestable evidence of the truth of the above remark. Sydenham, to whom belongs the merit of beginning the work of ascertaining whether epidemics follow each other in a determinate order, confined his views to his *own country, and the city wherein he lived*; and in doing so, pursued the only proper method of solving the matter in question.

The supposition that epidemics do occur in a determinate series, but in a different order in different countries, leads the mind to contemplate the interminable labour of investigating the immense variety of epidemic revolutions throughout the world, which collectively would form a grand cycle of epidemics. But such a task, it is believed, is not imposed on the medical philosopher. From the facts already accumulated, we may legitimately conclude, that epidemics not only follow each other in a different order in various countries, but also in the same place.

To calculate the future from the past is a favourite pursuit of the human mind. The civilian is no less curious in his speculations relative to the politi-

cal destinies of man, than is the physician with respect to the future occurrence of epidemics. The influence and policy of the former are well known to have some agency in determining the fortunes of a nation ; but how futile are his attempts to predict the order of successive revolutions in mind and empire : the prophetic labours of the latter, must, if possible, prove still more nugatory, seeing he has no control over the secret and desultory changes which are constantly going on in the air he breathes, and which constitute the varieties of epidemic meteoration. We cheerfully admit, however, that those insalutary states of the atmosphere, which have repeatedly occurred in every age, may occur again, and consequently, that past epidemics may be expected to return. There are, indeed, phenomena which indicate the approach of certain epidemic diseases ; but until those phenomena appear, no former observation will enable us to foretell the occurrence of such diseases, much less to determine their order and progression.

The proper method, therefore, of studying the philosophy of epidemics, is to devote particular attention to their causes, and the signs which are premonitory of their appearance. Were this method strictly pursued, as much benefit would accrue from it, as if it were true, and the fact well known, that epidemics recurred in a stated order, having indefinite periods of time between them ; for even then, attention to their prognostic signs would be equally necessary.

By arranging epidemics into three classes, according to their remote causes, we separate those diseases over whose prevalence we have a limited control, from those which no human means can avert. Of the former kind, are *contagious* and *infectious* disorders, and of the latter, such as are *meteorations*. This arrangement enables us to pronounce, in general terms, the important truth, that the prevalence of two distinct and well marked classes of epidemics, is, in a degree, fortuitous—a fact that puts for ever at rest the question, whether they succeed each other in a determinate order?

The universal adoption of vaccination has well nigh dispelled the terrors occasioned by the most fatal and loathsome disease in the catalogue of contagious epidemics; and though the other disorders of this class frequently appear, their prevalence may be checked by separating the well from the sick.

Infectious epidemics are in a considerable measure dependent on the localities of a country; and in some situations, their appearance is, for the most part, casual; thus, if animal and vegetable substances are suffered to accumulate and putrefy in the streets and enclosures of a city or country-town, the effluvia exhaled from those substances will ordinarily produce an infectious fever, which will certainly become extensively prevalent, if favoured by epidemic meteoration. Now this may be avoided

by attention to public cleanliness, and the removal of every source of noxious exhalations.

Marshy and low countries are less under the dominion of a medical police ; but in many instances, their insalubrity may be corrected by draining, cultivation, or extensive and continued inundation. Empedocles is said to have removed an infectious epidemic, by turning two streams of pure water into the stagnant river Selinus, the exhalations from which produced the disease. Such expedients have frequently, under every variety of epidemic meteoration, prevented the occurrence of infectious diseases. Europe enjoys, at present, a comparative exemption from the pestilential epidemics which formerly desolated that quarter of the world,—an exemption which is justly attributed to improvements in agriculture, the arts, and municipal economy. In a word, to render an infectious fever general through a town or section of country, there must be a concurrence of so many circumstances, both of an accidental and unavoidable nature, that, in common, it is easier to prevent the generation of miasmata, than it is to foresee when such a concurrence will happen.

Although it is obvious that the prevalence of contagious and infectious disorders is in a manner contingent, and of course, can take no place in a determined series of epidemics, it may still be questioned whether *meteorations* diseases do not occur in a particular order? or, to make the question

more general, whether insensible meteoration does not go through a determinate routine of modifications, at one time *producing* epidemics, and at other times *favouring* the successive prevalence of *contagious* and *infectious* diseases? However this may be, we know of no facts in support of the affirmative; the history of meteorations, as well as other epidemics, obviously leads to a conclusion directly opposite.

SECTION VI.

INQUIRY HOW FAR EPIDEMICS ARE CONNECTED WITH EXTRAORDINARY SEASONS, FAMINE, UNWHOLE- SOME FOOD, AND DISEASES AMONG BRUTES.

We formerly remarked, that the United States afforded a wide field for the cultivation of etiological science. Here, the causes of epidemics occur in their simplest combinations : and although we are unable to trace minutely the manner in which they are generated, yet it may be affirmed, that many of the circumstances which are enumerated by some European writers, as efficient causes of pestilence, are not necessary to its production. Thus we know that excessive crowding in cities, extraordinary seasons, as to their sensible effects on the constitution, famine, unwholesome food, and nakedness, are none of them essential to the rise and prevalence of *infectious epidemics*, except that produced by *idio-koino miasma*, which does, indeed, require domestic filth and crowding.

The discovery of what is, and what is not essential to the existence of an epidemic, is an important acquisition to medical science ; and with this knowledge, we are led to regard the circumstances

just mentioned as having a subsidiary, but never an *essential* influence in producing pestilential or other epidemic diseases.

In this country, as in every other, *contagious* epidemics depend on their respective poisons, and a favouring insensible meteoration. Our *infectious* epidemics, as well those which originate from *per-koino miasma* as from *protokoino miasma*, frequently occur in situations where crowding, famine, unwholesome food, and nakedness have no agency in their production. We therefore attribute them to miasmal poisons, engendered in the soil. They affect those who with temperance enjoy all the luxuries of life, though not perhaps in an equal degree with those who experience the evils of improvidence, or waste their energies in habits of sensuality. Epidemics arising from *idio-koino miasma* are probably often connected with the want of food and comfortable clothing. They generally occur in the lowest ranks of society, and in crowded camps. But that the privation of substantial food is not necessary to their occurrence, might be shown by numerous examples, where their victims have been well and abundantly fed. As to *meteorations epidemics*, they are obviously produced by some morbid quality of the atmosphere, independently of the individual and social conditions of men.

These observations are premised in order to show that those writers who have ascribed certain

epidemics to a multitude of morbid influences, slowly advancing and concentrating their forces to a point, at which they become pestilential, have not discriminated with sufficient care between the essential causes of epidemics, and those circumstances which at most are only accessory sources of disease. But let us examine the several topics embraced in this section, according to the rules of analytical research.

1. What influence have extraordinary seasons in originating Epidemics?

We are told that pestilence has frequently appeared after long and severe winters; and that other unusual seasons have been followed by epidemic disorders. Lord Bacon and some others have endeavoured to deduce from such observations, a series of prognostics relative to the appearance of subsequent diseases. But the exceptions to all of them are so numerous, and the peculiarities of the seasons so opposite, in regard to the prevalence of the same disease, that their value is in a great measure, if not entirely destroyed.

When it is said that a sickly season follows an unusually frosty winter, or that "great droughts in summer, lasting till towards the end of August, and some gentle showers upon them, and then some dry weather again, do portend a pestilent *summer the year following*;" or that "a dry March and a dry May portend a wholesome summer, if there be a showery April between; but otherwise, it is

the sign of a pestilential year ;”* we perceive that these prognostics are at most but plausible conjectures. That pestilence has followed such seasons no one will question, but that this sequence will always, or even generally happen, is contradicted by long experience. The prediction that one year will be *sickly*, and another *healthy*, can have no reference to the particular kinds of epidemic diseases, which will appear, for these arise from distinct causes, and are all of them regulated in their occurrence by the varieties of epidemic meteoration. But, in further discoursing on this subject, let us pursue the order of the seasons.

In every winter, whether rigorous or mild, the general diseases are either contagious or meteorationous ; for koino miasma is always extinct at this season. Now what are the prevailing diseases ? Are they contagious or meteorationous, or do both kinds exist at the same time, governed by the law of assimilation, formerly illustrated ? The answer to these questions may be given in the reply to another ; namely, what is the prevailing epidemic meteoration ? That this cannot be determined by the sensible qualities of the air is evident, since we know that different epidemics occur in winters which, in all respects, are apparently similar. Thus in one winter, the insensible meteoration favours the prevalence of small-pox, measles, or some other contagious disorders, and in another, produces

* Bacon, as quoted by Hancock

a distinct meteorationous epidemic. If, therefore, we are unable to determine what kind of epidemic will occur, under known circumstances of the weather in winter, it is obviously impossible to predict, whether a severe or mild winter will introduce a contagious, infectious, or meteorationous epidemic in the following summer and autumn. As we have no data except the sensible qualities of the air by which we can judge of the future, and as the succession of the varieties of epidemic meteoration is irregular, it is not within the reach of human penetration to foresee what species of epidemics will appear in any future season.

A mild or frosty winter, or one remarkable for vicissitudes, has, so far as can be discovered, no agency in determining the kind of epidemic meteoration which prevails at the time. If, at this season, a *meteorationous disease* be epidemic, the alterations of temperature will operate as exciting causes, and thereby multiply the cases of the reigning disease. Hence it is, that the same kind of epidemic meteoration, prevailing in winters unlike each other in regard to the sensible qualities of the air, very materially differs in the extent of its ravages. For example, when the *weather* is uniform and favourable to health, the disease is not *excited* in so large a number of persons as when its changes are sudden and frequent.

In attempting, therefore, to determine whether an approaching season will be *healthy* or otherwise, we should not presume, in the present state of

science, to foretell what *species* of epidemic will occur ; but if it can be predicted, what kind of *sensible meteoration* will prevail, it will not be difficult to calculate its effects in exciting disease and promoting the generation of infectious effluvia.

An intemperate and variable spring, whatever may have been the character of the preceding winter, will not be remarkable for sickness, unless an *epidemic meteoration* exist at the same time ; and accordingly, if in winter, we undertake to prognosticate the kind of sensible meteoration which will prevail in the following spring, with a view to pronounce upon the healthiness or unhealthiness of the season, it should be done under a distinct expression of the contingency just mentioned. As to the *contagious* eruptive fevers, *sensible meteoration* has no influence in favouring, or suppressing their prevalence, for they prevail in all seasons of the year ; and consequently, it is impossible to predict any thing relative to their epidemic appearance.

Our calculations respecting the kind of epidemic which will occur in an approaching summer and autumn, must also terminate in uncertainty. But if we can foresee the peculiarity of the sensible meteoration which will prevail, we shall have the best, and indeed, the only data meteorology affords, from which a correct judgment can be formed in regard to the salubrity of the season.

Sensible meteoration, in the summer and autumn, is well known to act directly and indirectly in producing disease ; directly in causing functional

derangements, and exciting disease, and indirectly in promoting the generation of infectious miasmata. Now should the weather be warm, moist, and calm, and the wind southerly, we may expect, that in marshy and filthy situations, miasmata will be produced, and that fevers will be the consequence ; but their form, diathesis, and extent of prevalence, will depend on the concurring insensible meteoration. Should this prove favourable to the occurrence of an infectious epidemic, the miasmata will obviously be the predominating morbid influence. A contagious or meteorationous epidemic, however, may appear in the warm months, and in this case, the epidemic meteoration will be unfavourable to the ravages of miasmal diseases.

To render a prognostic worthy of confidence, it should be founded on principles which are uniform in their operation. Now none of the prognostics of pestilence are founded on such principles ; for there are no phenomena in one season, which are uniformly followed by peculiar phenomena in the succeeding one. Hitherto, the predictions of philosophers, so far as we are acquainted with them, have had an exclusive relation to the diseases which occur in one part of the year. They prognosticate from the weather of the winter and spring, that pestilence will prevail in the following summer and autumn ; but never undertake to predict the epidemics of winter, by meteorological observations made in the preceding summer and autumn. If the latter is impossible, is not the former equally so ?

From these observations, we are induced to believe, that our knowledge on this subject may be summed up in a few words. In summer, we may safely affirm, that koino miasmal diseases will not prevail in the following winter; and that the disorders in this season will be contagious or meteorations, or both; but what particular diseases will appear, must remain a matter of conjecture. And again, in winter, we may assert, that infectious diseases will occur in the succeeding summer; but whether these, or, contagious or meteorations distempers will prevail extensively, must also remain problematical. In our predictions from the signs of the weather, therefore, we should limit our views to the kind of *sensible meteoration* which will prevail in an approaching season. If this can be correctly prognosticated, our knowledge of its *modus operandi* will readily enable us to determine what effect it will have on the public health.

But does not the influence of one season on the system leave a predisposition to disease the next? On this point, there can be no doubt. The tonic operation of the cold of winter, and the relaxing influence of the heat of summer, render the system particularly liable to disease whenever the seasons change. The effects of these annual variations of temperature are, in general, well understood; and it is only necessary to advert to them to show that they have no connexion with *epidemics*. They are the uniform consequences of those periodical alterations of sensible meteoration, which

constitute the revolution of the seasons. The predisposition, induced by the long continued operation of heat or cold, therefore, cannot be considered an *epidemic predisposition*, but an effect regular in its occurrence, though variable in force in different years.

In most countries, the seasons change progressively, and the system varies its condition in a corresponding manner, following the transitions for the most part, *pari passu*. Johnson remarks, that "a cold winter succeeding a hot autumn, or a hot summer succeeding a cold spring, will render the usual diseases of the seasons infinitely more severe."* When such effects occur, we might easily be led to suppose, that they depend on an epidemic state of the atmosphere, whereas, the fact is, they are, as Johnson correctly observes, the *usual diseases of the season*, which are rendered more severe, and of course, they can have no essential connexion with *epidemic meteoration*. Should an epidemic condition of the atmosphere, however, concur with such extraordinary variations of *sensible meteoration*, the most serious consequences will follow.

The opinion of Sydenham on the disorders in question, will form an appropriate conclusion to this division of our subject. Amidst all the difficulties which impeded his progress in the study of epidemics, he clearly perceived that a distinction should be made between the disorders which arise from *sensible meteoration*, and such as proceed from

* Practical Treatise on Derangements of the Liver, &c. p. 5.

the occult qualities of the air ; and accordingly, he distinguished them by specific epithets. The diseases produced by the former he called *intercurrent*, and those arising from the latter *stationary*. “ The fevers,” he says, “ that appear in all years (which we therefore call *intercurrents*) do proceed from some one or other *manifest quality* of the air ; for instance, pleurisies, quinsies, and the like, which generally happen when an intense and long continued cold is immediately succeeded by a sudden heat. It may therefore be, that the *sensible qualities* of the air have some share in producing those *intercurrent* fevers, which appear in every constitution of the atmosphere, but they do not cause the *epidemics* peculiar to the general constitution. And yet, at the same time, it must be acknowledged, that the above mentioned qualities of the air may more or less dispose the body to the particular epidemic disease ; and the same may be affirmed of any error in the non-naturals.”*

2. In what manner are famine and unwholesome food connected with Epidemics ?

Famine is sometimes partially experienced in countries in which there is not an absolute deficiency of provisions. In such cases, it is confined to the poor ; and is owing, either to their habitual indolence, or to their employment being interrupted by the suspension or derangement of commerce and manufactures. Famine may also occur in cities, under protracted sieges, or in consequence of the

* Works, page 5.

miscarriage of naval and military enterprises, whereby supplies are cut off, or not received in season. Allied to the calamity experienced on such occasions, is the necessity of subsisting on food of an unwholesome quality, an evil which is frequently experienced in armies and on board of ships. These several causes of famine have no natural connexion with the efficient causes of epidemics. They are altogether incidental; though their effects are evidently calculated to predispose to disease, and to aggravate an epidemic with which they may happen to be coincident.

But the causes of famine to be most dreaded, are those which occasion a positive and general deficiency of the means of subsistence, as when the earth does not yield its fruits in their wonted quantities, or when they are destroyed by predatory insects. As the causes here alluded to depend on natural occurrences, no human agency can entirely avert or control them.

The concurrence of famine from physical causes, with epidemic diseases, has been noticed from the earliest ages; and there is reason to believe, that their association is not accidental; but that it arises from their dependence upon similar atmospheric phenomena; and hence it is considered, that famine is never the primary and efficient cause of epidemics.

The causes of famine, however, are not equally attendant on the several kinds of epidemics. Contagious and meteorious diseases prevail in every

season of the year, and consequently their causes cannot be always identified with the peculiar meteoration that blights the fields, and destroys the hopes of the husbandman. It is therefore chiefly with infectious epidemics, which occur exclusively in the summer and autumn, that the causes of famine are found to be coincident.

It has already been stated, that there are *varieties* of epidemic meteoration, which favour the prevalence of *infectious* diseases. This fact will now enable us to explain how it happens, that infectious epidemics are sometimes accompanied by disease in the vegetable kingdom, and not at other times. Some of these varieties not only promote the generation of *koino miasma*, but induce a sickly disposition in vegetables, frequently impairing their fruits, and sometimes destroying them. Dr. Rush observes of the pestilential season of 1798, a year memorable in the United States, on account of the ravages of the yellow fever, "that peaches ripened this season three weeks sooner than in ordinary summers, and apples rotted much sooner than usual after being gathered in the autumn."* And Dr. Bayley, in his account of the yellow fever in New-York in 1795, after describing the destructive effects of the "constitution of the air" upon cabbages, goes on to observe, that "the effects of a peculiar season were shown also upon different kinds of fruit. It was remarkable, that cherries

* Medical Inq. and Obs. vol. iv. p. 45.

did not come to that perfection in which we commonly have them, and that they very soon showed a disposition to decay. Early in the season, the apple-trees were, very generally, extremely productive, and promised a large supply of their fruit in the autumn; but the expectations of the husbandman on this head were greatly disappointed; the apples began to fall at least a month before the usual time, and in a very imperfect state; and those which came to maturity could not be kept so long as it is common for them to be preserved." These facts conclusively show that epidemic meteoration is sometimes highly deleterious to vegetables.

But it seems that some of the varieties of epidemic meteoration which prevail in seasons of pestilence, are favourable to the growth and perfection of fruits. A striking variety of this kind existed during the plague in England in 1665. Dr. Hodges, in his account of that pestilence, states, "that this year was luxuriant in most fruits, especially cherries and grapes, which were at so low a price that the common people surfeited with them," and that "the markets being open as usual, and a great plenty of all provisions, was a great help to support the sick; so that there was the reverse of a famine, which hath been observed to be so fatal to pestilential contagions; and in this, the goodness of heaven is always to be remembered, in alleviating a common misery by such a profusion of good things from the stores of na-

ture.”* The difference between the epidemic meteoration here noticed, and that previously adverted to, is very remarkable;† and we think it clearly evinces, that hitherto, sufficient attention has not been given to the fact, that infectious epidemics are influenced by different kinds of epidemic meteoration—a truth highly important in a practical point of view.

Upon the same principles may be explained the fact that epidemics are frequently concomitant with an extraordinary multiplication of insects. Heat, and in most instances, moisture, are essentially necessary to their generation; but these alone seem inadequate to account for that prodigious increase of their numbers, which is observed in particular years. Certain states of the air, to us insensible, appear to be also necessary for their extensive

* Loimologia, p. 20, 21.

† At the first view, one might be inclined to ascribe these opposite phenomena to a difference in the *sensible meteoration* of different years. But the inquiries of Mr. Webster distinctly show, that such phenomena occur in seasons unlike each other, with respect to the manifest qualities of the air. “When excessive rains or dry seasons precede the failure of crops,” says he, “men are at no loss to assign the cause; although in these cases they may mistake the true cause. But it often happens, that grain fails of its usual perfection in seasons apparently the most temperate and favourable. Observing farmers remark, that, in certain years, when blast or mildew is expected from intemperate weather, grain proves to be good; at other times, the grain will shrink very much under a series of weather apparently the most propitious.” *History of Pestilential Diseases*, vol. ii. p. 99.

fecundity ; and it has long been observed, that those states of the atmosphere are generally favourable to the prevalence of *koino miasmal* diseases. Pestilence, a strong tendency in dead animal and vegetable substances to rapid decomposition, a morbid condition and general deficiency or immaturity of fruits, together with a vast amount of insect life, are so frequently coexistent, that there can be no hesitation in assigning to them a common dependence upon epidemic meteoration.

It is not, however, every kind of epidemic meteoration that occurs in the warm months, which contributes to the increase of insects. For it is observable, that when *contagious* and *meteorations* epidemics prevail in the summer and autumn, the animals in question are seldom extraordinarily multiplied. It is, therefore, those varieties of meteoration that exist during *infectious* epidemics, which generally animate the fields and marshes with the insect tribes ; and even among these varieties, there are probably some which do not particularly favour their generation. It is also worthy of remark, that in those pestilential seasons in which *epidemic meteoration* is specially suited to bring the ova of insects to maturity, the attendant *sensible meteoration* or unusual humidity of the soil, may prevent their evolution, or prove destructive to them.

To the above reflections we may add, that should meteoration stimulate vegetables into vigorous health and fruitful luxuriance, and at the same time,

exert an influence promotive of the multiplication of insects, the depredations of the latter on the former will rarely diminish the quantity of food to an amount that will endanger a famine ; but should insects abound in seasons when meteoration occasions a sickly condition and limited yield of fruits, whole plantations may be desolated, and consequently, man and beast be exposed to the most calamitous privations.

3. In what manner are the diseases of the inferior animals connected with Epidemics ?

In adverting to this interesting subject, we have to premise, that it will be impossible to treat it satisfactorily until the science of epizootic etiology is entirely remodelled ; for in its present state, the general truths of epidemics cannot be brought into a comparative examination with the loose statements and unarranged facts relating to the causes of diseases among brutes. To enter on this task at present would be incompatible with the limited design of this work. We may remark, however, that the plan we have pursued in arranging the causes of human diseases, will probably furnish an outline for a correct classification of the remote causes of epizootic disorders. That there are diseases among the lower animals which are *contagious*, *infectious*, and *meteorations*, is, perhaps, sufficiently evident ; but whether they admit of the same subdivisions, and are governed by the same laws as human disorders, remains to be determined. The difficulties which must attend inquiries on this

subject, are peculiar. There are, probably, some causes which are operative on all the species of domestic animals, and others which are peculiar to individual species. To discriminate those causes, and to ascertain their natural affinities, with a view to their generalization, will demand much patient research. A few cursory remarks on the more general causes, will embrace all we have to offer on this subject.

The murrains which occasionally prevail through extensive districts of country, obviously arise either directly from meteoration, or from causes which owe their existence to its influence. Writers on epidemics have been at much pains to connect these murrains with popular diseases; but hitherto they have failed to discover any determinate affinities between them.

The dependence of certain epizooties, however, upon meteoration, evidently renders it proper to consider them in connexion with epidemics. The appearance of diseases among domestic animals has long been regarded as indicative of an epidemic state of the atmosphere; but it seems, the question has never been investigated, whether those diseases more frequently appear with *contagious*, than with *infectious* or *meteorationous* epidemics.

Sometimes a disease rages among the inferior animals without being accompanied by a corresponding disorder in the human family, and *vice versa*; at other times, an epizooty and epidemic prevail simultaneously. A satisfactory exposition of

these apparent anomalies cannot be given, unless we resort to the *varieties of insensible meteoration*.

The opinion has been long received, that an epizooty portends an epidemic; and there are many examples in the history of popular diseases which seem to render it plausible. Facts of this kind are noticed by Homer, and other ancient poets. Thus it is said, that

“ On mules and dogs the infection first began,
And last the vengeful arrows fix’d in man.”*

“ For all those plagues which earth and air had brooded,
First on inferior creatures try’d their force,
And last they seiz’d on man.”†

That epizooties have frequently preceded pestilential and other epidemics, is undoubtedly true; but it is equally certain, that their occurrence is sometimes reversed;‡ and consequently, there is no more propriety in asserting that epizooties forerun epidemics, than that the latter are precursors of the former.

Without attempting to explain the intimate etiological relations between the diseases of man and brutes, we may observe, that the varieties of epidemic meteorations afford a general explanation of the phenomena in question. Thus, some of those varieties appear to be alike favourable to the pre-

* Pope’s Iliad, Book i.

† Dryden’s Œdipus.

‡ See Edinburgh Encyclopædia.—Art. Epizooty.

valence of epizootic and epidemic disorders; others are not so, but favour the rise of the former to the exclusion of the latter, or contrariwise. The variable succession of these distempers appears to be owing to the transitions of insensible meteoration.

When a *meteoration* epizooty is prevalent, unattended by an epidemic, it is obvious, that the meteoration which produces that epizooty is not directly injurious to man, for, were it so, an epidemic would necessarily exist. Should both, however, occur at the same time, a different variety of epidemic meteoration must prevail, noxious alike to man and the lower animals. Knowing, therefore, that the insensible meteoration, which produces an epizooty, will not certainly change into a *variety* deleterious to man, it is manifestly improper to state it as a general truth, that the appearance of disease among brutes portends an epidemic. Even whether such a succession is more frequent than otherwise, is a question yet undetermined.

As the remarks just made relate exclusively to *meteoration* diseases, we have now to observe, that during the existence of *infectious* epidemics, the inferior animals are variously affected by the prevailing morbid influences. Sometimes a great mortality takes place among particular species; and at such times, birds occasionally flee from the pestilential region; at other times, none of these phenomena are remarkable. The several *species* of infection do not vary enough in their qualities

to account for these phenomena, and consequently, we are compelled to attribute them to the *varieties* of epidemic meteoration, and particularly as they are frequently observed to occur without the reach of the *pestilential miasm*, the influence of which is usually circumscribed within narrow limits. Some of those varieties, however, may render domestic and other animals highly susceptible of the morbid impressions of *infection*, or this being innocuous, the insensible meteoration may, of itself, be adequate to their destruction.

A full discussion of the subject of epizooties, and their connexion with epidemics, would embrace a view of all their *efficient* causes, and also, an inquiry into the predisposing influence of famine, unwholesome food, and the effects of sensible meteoration on brute creatures. And in concluding, we cannot but express the hope, that some one competent to the undertaking, will enter upon the investigation; bearing in mind, that some of the most important advances in medical science have resulted from studies directed to comparative physiology and pathology.

SECTION VII.

A SUMMARY REVIEW OF THE NATURE AND OPERATIONS OF EPIDEMIC METEO- RATION :—AND CONCLUSION.

It was incidentally remarked in a former section, that there is no time in which it can be said, that acute diseases do not derive a part of their character from the secret influences of the atmosphere. Hitherto, it has been the custom to speak of the insensible qualities of the air, only when diseases assumed an extraordinary character. But we apprehend, that there is as much propriety in considering their simple and benign forms, as resulting, in a measure, from the operation of insensible meteoration, as there is in ascribing malignant and anomalous effects to that cause. This idea is certainly more consonant with the general economy of nature, than the supposition, that, at certain times, the atmosphere has no insensible influence on the human system. The probability is, that in seasons of general health, the latent influences of the common atmosphere are not essentially different in their nature from those which produce or favour the prevalence of epidemic diseases. It is true, those

occult qualities of the air which exert a genial influence on the system, cannot, correctly speaking, be called *epidemic meteoration*; but still, in order to obtain a clear and enlarged view of the various properties of the atmosphere, it is no less important to consider those states of it which are salubrious and give a mild cast to disease, than it is to investigate those which are manifestly morbid and destructive to life.

The atmosphere surrounding the earth has, in every part of it, a two-fold influence on animal bodies; namely, *sensible* and *insensible*. The impressions arising from the former are well known to be extremely various; and, it is probable, that the effects of the latter are equally diversified. Although there is no evidence that the two kinds of changes, which take place in the qualities of the air, have any dependence upon each other, yet the character of the one may be illustrated by that of the other.

The temperature and moisture which constitute *sensible meteoration*, seldom correspond in any two countries remote from each other. They are also very different in the same country in different years or series of years. Sometimes, they vary from their ordinary range throughout a continent and hemisphere for several successive years, fluctuating, however, at all times, in diurnal vicissitudes. Hence the atmosphere, taken in its whole extent, presents a great variety of sensible modifications,

which in some parts may be favourable to health, and in others productive of disease.

Now *insensible* or *epidemic meteoration* is supposed to be of the same mutable nature. In one country, it may be conducive to general health; in another, may occasion a meteorations epidemic; in a third, may promote the extension of contagious diseases, and in others, favour the prevalence of infectious epidemics. In this manner, the atmosphere may manifest by its effects a great number of secret modifications which are similar in no two countries, or else alike, or nearly so, in several and distant districts at the same time.

In instituting this comparison, we are aware that the variations of the *secret* qualities of the atmosphere do not admit of graduation like those of temperature and moisture. That they do not range through a uniform scale or series of changes, whenever they pass from one variety into another, is more than probable. Our only object in that comparison is to show, that the insensible qualities of the air are subject to variations as numerous and extensive as sensible meteoration, though governed by different laws. If, indeed, there be properties in the atmosphere which to us are insensible, and which are positively variable, we may fairly infer the probability, that their changes have relatively an influence on man, as diversified as the impressions of temperature.

In this view of the subject, we entirely avoid the gratuitous hypothesis that epidemic meteoration

arises from foreign and deleterious principles, casually introduced and extensively diffused through the atmosphere.

A more philosophical conclusion is, that *epidemic*, like *sensible* meteoration, consists of certain modifications or proportional combinations of the component parts of the atmosphere. Thus, the vicissitudes of temperature, considered as occasional causes of disease, do not imply the existence of extraneous and poisonous substances in the air; but only the increase and diminution in the quantity of a principle, namely, *caloric*, the presence of which in the atmosphere in certain proportions is *essential* to the well being of man. So epidemic meteoration probably consists of varied proportions of certain elements which enter into the natural composition of the atmosphere, and which, in given quantities, are essential to life. Every thing, however, relating to the nature of the morbid occult qualities of the air, is yet involved in obscurity. We know of but one element, whose agency can be suspected of being principally operative in originating them, viz. electricity; but how far this and the other constituents of the atmosphere are concerned in their production, we leave for the investigation of the meteorologist. Whatever be the nature of epidemic meteoration, the first object of the practical physician should be to ascertain its effects, and to determine its laws;—all of which, we think, may be done without a knowledge of its essential constitution. We know nothing of the nature of gravita-

tion or of mind ; and yet their phenomena may be analyzed, and systematically arranged ; and why may not the same be accomplished with the phenomena of epidemic meteoration ?

But to conclude : we are strongly inclined to doubt, whether any light can be thrown on the origin of the variable and frequently anomalous character of epidemics, by the study of meteorology as it is usually prosecuted. Facts, relating to the peculiarities of the seasons, and the sensible qualities of the air, have been faithfully recorded for a long course of time ; and yet, multitudinous as they have become, they furnish no data from which we are enabled to assign the precise causes of atmospheric epidemics, or the various *diatheses* of other popular diseases. Indeed, we think, the time has arrived in which it is proper to abandon the expectation of being able to discover the origin and nature of those disorders, by observing and recording the quantity of rain, and the diurnal changes in the weight, temperature, and moisture of the air. Nevertheless, in another view of the subject, these phenomena are worthy of particular attention. Some of them are directly productive of common febrile and phlegmasial diseases, or co-operate as exciting causes, with various other morbid agents ; others are concerned in generating miasmatal poisons, while all of them, acting as climatorial influences, tend to induce functional derangements, and also to modify, in a degree, the character of epidemics. The sensible qualities of

the atmosphere, however, never occasion epidemic diseases, nor give to them those remarkably diversified appearances which they exhibit in different years. These arise, for the most part, from those states of the air which our senses and the instruments of philosophy are unable to detect. It is, therefore, only by the study of epidemics, and particularly by observing their rise, progress, and decline, and by comparing their aspects and tendencies, as they appear in different years, under the same and opposite circumstances of the weather, in a word, by making the human body in a state of disease, the instrument of research, that it will be possible for the physician to acquire a knowledge of the changes which take place in the secret properties of the atmosphere.

THE END.



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